

centrifuge - Cat. No.: 10380, 10380R
user manual - Cat. No.: 20380/R/ENG



2012-06-12

USER MANUAL



LABORATORY CENTRIFUGE

MPW-380/R



Read this before use!

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Warning signs and hazard icons.

**WARNING!**

Warning of potential injury or health risk.

**DANGER!**

Risk of electric shock with potential for severe injury or death as a consequence.

**DANGER!**

Biohazard with potential for risk to health or death as a consequence.

**DANGER!**

Risk of explosion with potential for severe injury or death as a consequence.

Statement of Conformity:

The following machine is in accordance with the regulations of the EU Directive 98/79/EC and with the harmonized standards PN-EN 61010-1 and PN-EN 61010-2-020.

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Annexes:

- Statement of conformity
- Declaration of decontamination (repair)
- Declaration of decontamination (returning device)

1. Application.

The MPW-380/R centrifuges are table top laboratory centrifuges for *in vitro* diagnostic (IVD). MPW-380R is equipped with cooled rotating chamber, used to separation of samples took from people's, animal's and plant's components with different densities, under the influence of the centrifugal force, to provide information about their biological state (MPW-380 – without cooling). Its construction ensures easy operation, safe work and wide range of applications at laboratories engaged in routine medical analyses, biochemical research works etc. This centrifuge is not biotight and therefore during centrifugation of preparations requiring biotightness one has to use closed and sealed containers and rotors. In the centrifuge, it is prohibited to centrifuge caustic, inflammable and explosive preparations.

2. Technical data.

manufacturer	MPW Med. instruments 46 Boremlowska Street, 04-347 Warsaw, Poland				
type	MPW - 380		MPW - 380R		
cat no.	10380		10380R		
mains voltage	230V	115 V	230 V	230 V	115 V
mains frequency	50/60 Hz		50 Hz	60 Hz	60 Hz
connected load	0,8 kW		1,3 kW		
current protection	10 A	12 A	14 A	14 A	16 A
cooling medium	---		R507*		
capacity (max.)	1600 ml				
speed – RPM	100 ÷ 18000 (10s resolution)				
force – RCF	31150 x g				
kinetic energy (max.)	19559 Nm				
running time counting	5 s ÷ 9 min 59 s (1s resolution), 10 min ÷ 9 godz 59 min (1min resolution) till start, effective centrifuging time calculation				
short-time operation mode	yes				
continuous operation mode	yes				
operation programs	99				
operating temperature	... ÷ 40°C		-20 ÷ 40°C		
precooling**	no		yes, 2500 RPM, 4°C		
cooling without	no		yes		
acceleration curves	10 (linear)				
deceleration curves	10 (linear)				
adjustable curves:					
acceleration	10 curves (4 points)				
deceleration	10 curves (4 points)				
USB interface	yes***				
EMC	PN-EN 55011				
ambient conditions (PN-EN 61010-1 1.4.1)					
set-up site	indoors only				
ambient temperature	5° ÷ 40°C				
humidity (maximum relative humidity)	< 80%				
excess-voltage category	II		(PN-EN 61010-1)		
pollution degree	2		(PN-EN 61010-1)		
safety area	300 mm				
dimensions					
width	515 mm		715 mm		
depth	650 mm		650 mm		
height	455 mm		455 mm		
noise level	56 dB				
weight	~ 74 kg		~ 112 kg		

* CFC, HCFC free

** program no. 1

*** option

2.1. Accessories.

2.1.1. Basic accessories (delivered with every centrifuge).

Cat. No.	Accessories	
17798	Complete clamp	pcs 1
17799	Spanner for the rotor	pcs 1
17642	Spanner for emergency opening of the cover	pcs 1
17009	Power cord 230 V	pcs 1 or
17010	Power cord 115 V (optionally)	pcs 1
20380/R/ENG	User manual	pcs 1

2.1.2. Optional accessories.

Depending on customer's needs the MPW-380/R centrifuge can be provided with below specified accessories:

ANGLE ROTORS

Cat. No	Type of rotor	Angle	Rotor capacity	Max rpm	RCF	r _{max} [cm]	r _{min} [cm]
11761	Angle rotor HSL	45°	30 x 2,0/1,5 ml	16400	29168	9,7	6,5
11762	Angle rotor HSL	45°	36 x 2,0/1,5 ml	18000	30065	8,3	5,0
11763	Angle rotor HSL	45°	48 x 2,0/1,5 ml	16400	28265	9,4	6,2
11765	Angle rotor HSL	45°	12 x 8 x 0,2 ml PCR strip	16400	28566	9,5	8,4
11766	Angle rotor HSL	45°	12 x 10 ml/81 mm	18000	31150	8,6	5,0
11767	Angle rotor HSL	30°	12 x 10 ml/100 mm	14000	20598	9,4	5,0
11769	Angle rotor HSL	45°	60 x 2,0/1,5 ml	16400	29168	9,7	6,5
11770	Angle rotor HSL	30°	12 x 15 ml Falcon	14000	23227	10,6	4,6
11772	Angle rotor HSL	30°	8 x 30 ml Nalgene (25x98)	17500	29787	8,7	3,2
11773	Angle rotor HSL	30°	6 x 50 ml Nalgene (28x106)	14500	21625	9,2	3,0
11775	Angle rotor HSL	30°	8 x 50 ml Nalgene	14000	21255	9,7	5,0
11776	Angle rotor HSL	30°	8 x 50 ml Falcon	14000	23666	10,8	5,0
11777	Angle rotor HSL	25°	4 x 250 ml	10000	14086	12,6	5,7
11778	Angle rotor HSL	30°	6 x 94/85 ml Nalgene	12000	17710	11,0	4,0
11779	Angle rotor HSL	45°	36 x 2,0 ml Filter	15000	22136	8,8	5,0
11780	Angle rotor	30°	12 x 50 ml Falcon	4500	3328	14,7	8,3
11784	Angle rotor	30°	36 x 15 ml Falcon	5000	3996	14,3	6,0
11785	Angle rotor	30°	48 x 15 ml Falcon	4700	4025	16,3	8,0

HS – hermetically sealed

HS accessories maintenance.



Make sure that rubber O-rings are lightly coated with silicone grease. Use high vacuum grease, e.g. type „C“ by LUBRINA.

SWING-OUT ROTORS

Cat. No	Type of rotor	Rotor capacity	Max rpm	RCF	r _{max} [cm]	r _{min} [cm]
12768	Swing-out drum rotor	6 adapters 20 x 0,4/0,2 ml or 10 x 2,0/1,5ml	14500	16450	7,0	3,0
12786	Swing-out rotor	4 x 250 ml	5000	4724	16,9	12,4
12787	Swing-out rotor	2 x 3 micro titer plates and blocks	4300	2398	11,6	5,5
12788	Swing-out rotor	4 x 4 micro titer plates and blocks	4000	2826	15,8	10,0
12791	Swing-out rotor	4 x ASTM	2500	1292	18,5	4,0
12830*	Swing-out rotor	4x400ml, (48x15ml, 48x15ml Falcon, 8x100 ml)	4500	4188	18,5	8,5

* - 4000 rpm, RCF = 3309 for MPW-380

BUCKETS

<u>Catalog no</u>	<u>Application</u>
13080	Bucket ϕ 17,7x87 mm for 15/10/7/6 ml test tubes for rotor 11784, 11785;
13081	Bucket ϕ 17,7x65 for 10/6/5 ml test tubes for rotor 11784, 11785;
13174	Round bucket ϕ 62x107 mm for 250 ml bottles for rotor 12786;
13178c	Round bucket ϕ 62x107 mm for 250 ml bottles with cap 17179 for rotor 12786;
13180	Bucket ϕ 30x99 mm for 2 x 50 ml Falcon test tubes for rotor 12786;
13275c	Bucket ϕ 30x99 mm for 50/30/25 ml Falcon test tubes with cap 17151 for rotor 11780;
13276	Bucket ϕ 30x96 mm for 50/30/25 ml Falcon test tubes without thread for rotor 11780;
13580	Bucket ϕ 45x116 mm for 2 glass test tubes 50ml for rotor 12786;
13286	Bucket 85x130x60 mm for 2-5 microtiter plates and block for rotor 12787;
13789	Bucket 85x130x60 mm for 1-4 microtiter plates and block for rotor 12788;
13792c	Bucket for ASTM with cap 17792 for rotor 12791;
13831c	Rectangular bucket with cap 17832 for rotor 12830;
13833c	Round bucket 400 ml with cap 17834 for rotor 12830;
13865	Bucket for 7 test tubes 50 ml Falcon for rotor 12830;
13866	Bucket for 6 test tubes 50 ml Falcon for rotor 12830;

ROUND CARRIERS

<u>Catalog no.</u>	<u>Application</u>
♦ ♦ 14000	Adapter 20x0,4 ml for rotor 12768;
♦ ♦ 14002	Adapter 10x2,0/1,5 ml for rotor 12768;
14017	Pad for 250 ml round-bottom bottles for rotor 12177 and buckets 13174, 13178;
14036	Round carrier ϕ 28,5 special test tube ml (ϕ 13,5x92 mm) for rotor 11469, 11773, 11775
14043	Round carrier ϕ 29 for test tubes 5 ml (13x85) for rotor 11457, 11776;
14047	Round carrier ϕ 16,8 for test tubes 5 ml (13x85) for rotor 11466, 11770;
14071	Round carrier for 30 ml test tubes nr 15055 (ϕ 25x100 mm) for rotor 11776;
14082	Round carrier ϕ 17,6 for 7/5 ml test tubes (ϕ 13,3x100 mm) for bucket 13080 and 13081;
14084	Round carrier ϕ 11,0 for 0,5 ml test tubes (ϕ 8,0x30 mm) for rotor 11761, 11762, 11763;
14089	Round carrier ϕ 29,0 for 15 ml Falcon test tubes (ϕ 17x120 mm) for rotor 11780 and bucket 13275, 13276;
14126	Round carrier ϕ 11 for 0,4 ml test tubes (ϕ 5,8x46 mm) for rotor 11761, 11762, 11763;
14133	Round carrier ϕ 10,8 for 0,2 ml test tubes (ϕ 6,2x21 mm) for rotor 11761, 11762, 11763;
14151	Round carrier ϕ 61 for 1x100 ml test tubes (ϕ 46x100 mm) for bucket 13174, 13178;
14152	Round carrier ϕ 61 for 1x50 ml Falcon test tubes (ϕ 30x120 mm) for bucket 13174, 13178;
14153	Round carrier ϕ 61 for 5x15 ml Falcon test tubes (ϕ 17/22x120 mm) for bucket 13174, 13178;
14154	Round carrier ϕ 61 for 9x 5 ml test tubes (ϕ 13,5/17x81 mm) for bucket 13174, 13178;
14155	Round carrier ϕ 61 for 12x7/5 ml test tubes (ϕ 13/14,5x100 mm) for bucket 13174, 13178;
14156	Round carrier ϕ 61 for 8x14/10 ml test tubes (ϕ 17/17,7x113 mm) for bucket 13174, 13178;

14157	Round carrier $\phi 61$ for 4x15 ml test tubes ($\phi 17/22 \times 120$ mm) for bucket 13174, 13178;
14158	Round carrier $\phi 61$ for 12x2,0 ml Eppendorf test tubes ($\phi 11 \times 43$ mm) for bucket 13174, 13178;
14159	Round carrier $\phi 45$ for 1x50 ml test tubes ($\phi 35,5 \times 100$ mm) for bucket 13833 and round carrier 14850 and buckets 13174, 13178 and round carrier 14151;
14160	Round carrier $\phi 61$ for 3x30/25 ml test tubes ($\phi 25,5 \times 100$ mm) for bucket 13174, 13178;
14188	Pad for 100/50 ml test tubes for round carrier 14841;
14248	Round carrier $\phi 29,8$ for 30/25 ml test tubes ($\phi 26 \times 100$ mm) for bucket 13275 and 13276;
14793	Round carrier 83x95 mm test tubes 13x15 ml Falcon ($\phi 17 \times 120$ mm) for bucket 13831;
14794	Round carrier for ASTM laboratory ware of 160 mm lengths 15797;
14795	Round carrier for ASTM laboratory ware of 167 mm lengths 15796;
14836	Round carrier 83x95 mm for 24x5 ml test tubes ($\phi 13 \times 75$ mm) for bucket 13831;
14837	Round carrier 83x95 mm for 16x10 ml test tubes ($\phi 17 \times 100$ mm) for bucket 13831;
14838	Round carrier 83x95 mm for 12x15 ml test tubes ($\phi 17 \times 120$ mm) for bucket 13831;
14839	Round carrier 83x95 mm for 8x30 ml test tubes ($\phi 26 \times 102$ mm) for bucket 13831;
14840	Round carrier 83x95 mm for 5x50 ml test tubes ($\phi 30 \times 120$ mm) for bucket 13831;
14841	Round carrier 83x95 mm for 2x100 ml test tubes ($\phi 45 \times 103$ mm) for bucket 13831;
14842	Round carrier 83x95 mm for 250 ml bottle ($\phi 62 \times 135$ mm) for bucket 13831;
14844	Round carrier 83x95 mm for 26x2,0 ml test tubes ($\phi 11 \times 43$ mm) for bucket 13831;
14845	Round carrier $\phi 84$ mm for 18x5 ml test tubes ($\phi 13,5 \times 75$ mm) for bucket 13833;
14846	Round carrier $\phi 84$ mm for 12x10 ml test tubes ($\phi 17 \times 100$ mm) for bucket 13833;
14847	Round carrier $\phi 84$ mm for 12x15 ml test tubes ($\phi 17 \times 120$ mm) for bucket 13833;
14848	Round carrier $\phi 84$ mm for 5x30 ml test tubes ($\phi 26 \times 102$ mm) for bucket 13833;
14849	Round carrier $\phi 84$ mm for 4x50 ml test tubes ($\phi 30 \times 120$ mm) for bucket 13833;
14850	Round carrier $\phi 84$ mm for 100 ml test tubes ($\phi 45 \times 103$ mm) for bucket 13833;
14851	Round carrier $\phi 84$ mm for 250 ml bottle ($\phi 62 \times 135$ mm) for bucket 13833;
14853	Round carrier $\phi 84$ mm for 24x2,0 ml test tubes ($\phi 11 \times 43$ mm) for bucket 13833;
14854	Round carrier $\phi 84$ mm for 200 ml bottle ($\phi 57 \times 113$ mm) for bucket 13833;
14855	Round carrier $\phi 38$ mm for 50 ml Falcon test tubes ($\phi 30 \times 120$ mm) for rotor 11778;
14856	Round carrier $\phi 38$ mm for 15 ml Falcon test tubes ($\phi 17 \times 120$ mm) for rotor 11778;
14859	Round carrier $\phi 84$ for test tubes 3x50 ml ($\phi 35 \times 100$ mm) for bucket 13833;
14860	Round carrier $\phi 83 \times 95$ for test tubes 28x1,2 ml S-Monovette ($\phi 9 \times 82,3$ mm) for bucket 13831;
14862	Round carrier $\phi 83 \times 95$ for test tubes 25x5 ml ($\phi 13,1 \times 100$ mm) for bucket 13831;
14864	Round carrier $\phi 38$ for test tubes 24x1,2 ml S-Monovette ($\phi 9 \times 82,3$ mm) for bucket 13833;

TEST TUBES

<u>Catalog no</u>	<u>Specification</u>
15011	Polypropylene round-bottom test tube 2 ml with cap ($\phi 10,8 \times 40$ mm);
15016	Polypropylene test tube 1,2 ml s-Monovette ($\phi 8,8/13,3 \times 82,3$ mm);
15017	Polycarbonate round-bottom bottle 250 ml ($\phi 62 \times 122$ mm);
15015	Polypropylene test tube 2 ml with cap ($\phi 10,8 \times 41,2$ mm);
15040	Polypropylene test tube 100 ml with cap ($\phi 44,5 \times 103$ mm);
15046	Polypropylene test tube 14 ml with cap ($\phi 16,8 \times 113$ mm);
15048	Polypropylene test tube 15 ml Nalgene ($\phi 16 \times 113$ mm);
15050	Polypropylene test tube 15 ml Falcon ($\phi 17/21 \times 120$ mm);
15051	Polypropylene test tube 50 ml Nalgene ($\phi 28,8 \times 106,7$ mm);
15052	Polypropylene test tube 50 ml Falcon ($\phi 30/35 \times 120$ mm);
15053	Polypropylene test tube 10 ml with cap ($\phi 16/19 \times 100$ mm);
15054	Polypropylene test tube 6 ml with cap ($\phi 11,5 \times 92$ mm);
15055	Polypropylene test tube 30 ml with cap ($\phi 24,8 \times 100$ mm);
15056	Polycarbonate test tube 30 ml Nalgene with cap ($\phi 25,5 \times 94$ mm);
15067	Polycarbonate test tube 85 ml Nalgene with cap ($\phi 37,8 \times 106$ mm);
15102	Micro titer plate with cap ($85,5 \times 127$ mm);
15115	Glass tube 100 ml ($\phi 45 \times 100$ mm);

15116	Glass tube 50 ml (ϕ 35x100 mm);
15118	Glass tube 10 ml (ϕ 16x100 mm);
15119	Glass tube 7 ml (ϕ 12x100 mm);
15120	Glass tube 5 ml (ϕ 12x75 mm);
15121	Polypropylene test tube 10 ml with stopper (ϕ 17x70 mm);
15122	Polypropylene PCR test tube 8x0,2 ml (ϕ 6x21 mm);
15124	Polypropylene test tube 0,4 ml (ϕ 5,7x46 mm);
15125	Polypropylene test tube 0,2 ml PCR (ϕ 6x21 mm);
15127	Polypropylene test tube 0,5 ml with cap (ϕ 7,8x30 mm);
15128	Polypropylene test tube 1,5 ml with cap (ϕ 10,8x39 mm);
15130	Polypropylene PCR test tube 8x0,2 ml (ϕ 6x21 mm);
15131	Polypropylene PCR test tube 4x0,2 ml (ϕ 6x21 mm);
15175	Polypropylene bottle 250 ml Herolab (ϕ 61,5x125 mm);
15176	Polycarbonate bottle 250 ml Herolab (ϕ 61,5x135 mm);
15419	Polypropylene test tube 5 ml (ϕ 12x75 mm);
15424	Polypropylene test tube 30 ml Nalgene with cap (ϕ 25,5x94 mm);
15440	Polypropylene bottle 200 ml (ϕ 56,5x113 mm);
15796	Glass centrifugal vessel ASTM cylindrical, in the lower part conical lengths 167 mm BRAND no 3623 38;
15797	Glass centrifugal vessel ASTM in the shape of the pear, in the lower part conical lengths 160 mm BRAND no 3621 38;
15852	Polypropylene bottle 400 ml (ϕ 84x135 mm);

OTHER ACCESSORIES

<u>Catalog no</u>	<u>Specification</u>
16412	Locker under centrifuge
◆ ◆ 16594	Data recording set of working parameters by serial RS 232 pin;
◆ ◆ 16595	Thermal printer of working parameters by serial RS 232 pin;
17151	Polycarbonate cap for bucket No. 13275;
17179	Aluminum cap for bucket No. 13178;
17792	Aluminum cap for bucket No. 13792;
17832	Polycarbonate cap for bucket No. 13831;
17834	Aluminum cap for bucket No. 13833;

CAUTION! “◆ ◆” manufactured for individual order.

2.2. Exploitation materials.



For operating in centrifuge one should use only original company's buckets comprised in the specification of accessories as well as test-tubes for centrifuges of proper diameter, length and strength. Utilization of test-tubes of other makes shall be agreed upon with manufacturer of the centrifuge. For cleaning and disinfecting one should use agents generally applied in the health service, such as e.g. *Aerodesina-2000*, *Lysoformin 3000*, *Melseptol*, *Melsept SF*, *Sanepidex*, *Cutasept F*.

3. Installation.

3.1. Unpacking the centrifuge.

Open the package. Take out the cardboard box containing the accessories. Take out the centrifuge from the package. Keep the package and packing materials at hand for service transport.

3.2. Location.



The centrifuge shall not be located near the radiators and shall not be subjected to direct sunlight. The table for the centrifuge shall be stable and shall have flat-levelled table top. It is necessary to ensure a safety zone of the minimum 30 cm round the centrifuge from every direction. Normal operating conditions ambient temperature is from 15° C to 35° C. Passed parameters of the centrifuge are referring to the above named temperatures. At the change of the place from cold to warm one, condensation of water will occur inside the centrifuge. It is important then that sufficient time be provided for drying the centrifuge prior to starting the centrifuge again (minimum 4 hours).

3.3. Connection to mains.



Supply voltage given on the rating plate has to be consistent with local supply voltage. MPW Med. instruments laboratory centrifuges are 1st safety class devices and they are provided with the three-core cable with the plug resistant to dynamic loadings. Mains socket shall be provided with the safety pin. It is recommended to install emergency cut-out that shall be located far from the centrifuge, near the exit or beyond the room.

Supply voltage 230 V 50 Hz, optionally 230 V 60 Hz, 115 V 60 Hz.



***Before switching on, check whether the centrifuge is connected to power supply correctly.
Check centrifuge before usage whether she is installed correctly.***

3.4. Current protection.

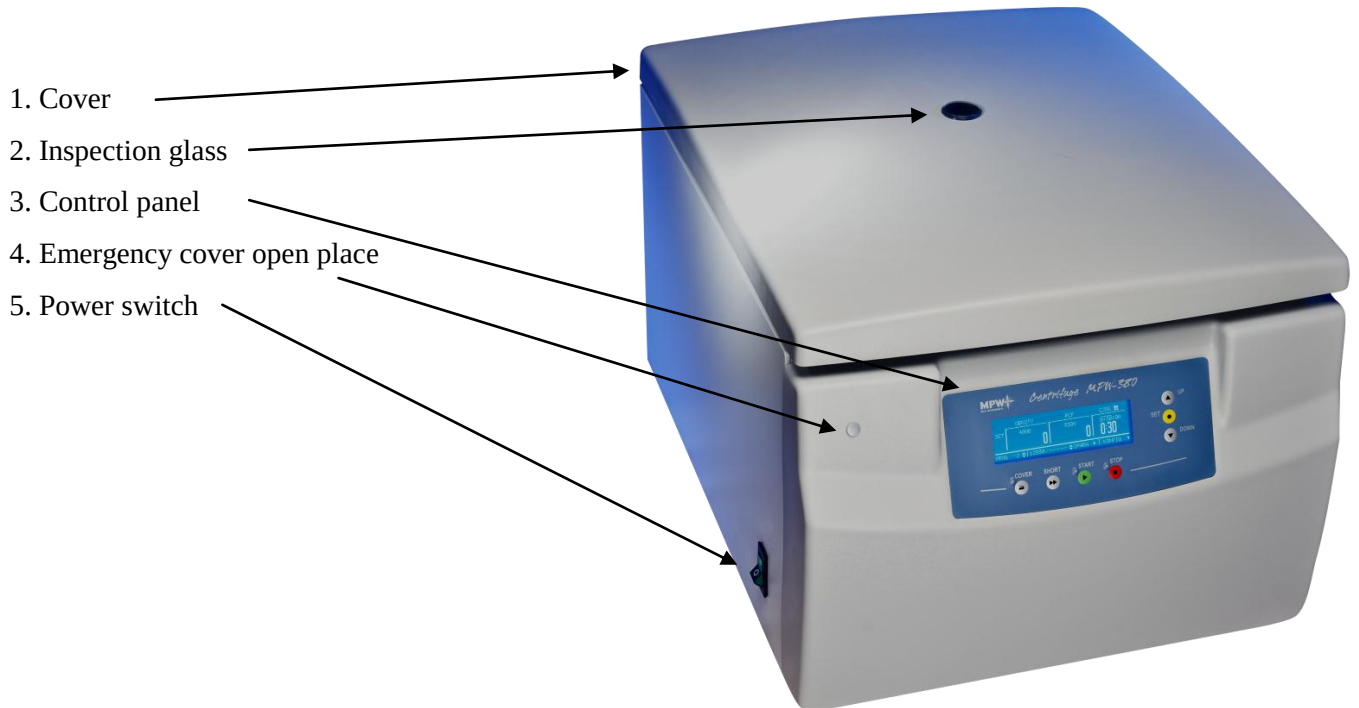
The centrifuge has thermal current protection of 14 A values 230V (TA 45 A124 L140U3), optionally 16A 115V (TA 45 A124 L160U4) is situated in the power switch on the left side of the centrifuge.

4. Description of the centrifuge.

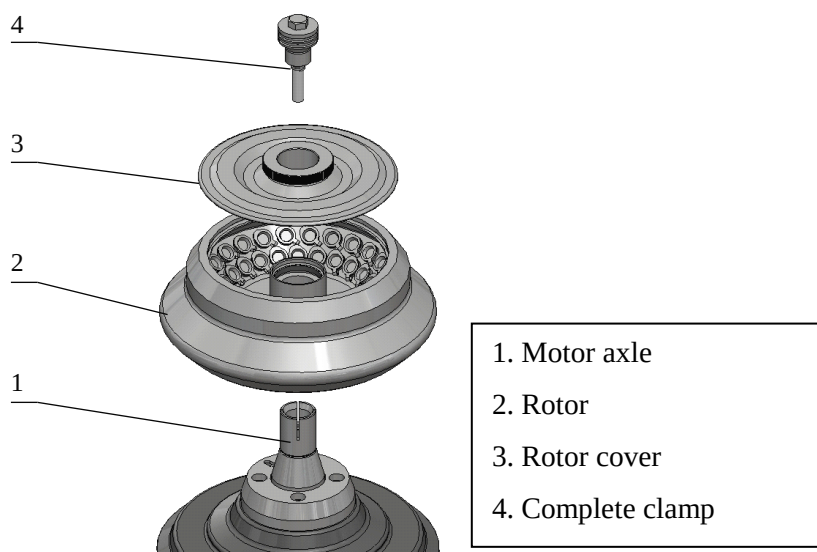
4.1. General description.

New generation of MPW Med. instruments laboratory centrifuges is provided with state-of-the-art microprocessor control systems, very durable and quiet asynchronous brushless motors and accessories consistent with requirements of the present-day user.

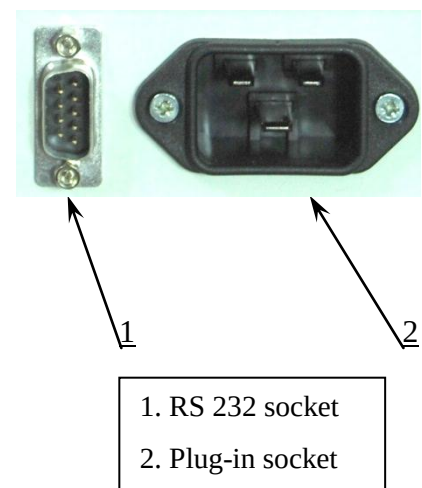
4.2. Service elements.



Drawing 1. General view



Drawing 3. Unit elements of the angle rotor



Drawing 2. Back of the centrifuge

5. Safe working conditions.

5.1. Servicing personnel.

The MPW-380/R laboratory centrifuge can be operated by laboratory personnel after getting acquainted with User manual.



***User manual shall be held all the time near the centrifuge.
User manual must be kept always at hand!!!***

5.2. Guarantee and operational use period.

Guarantee period amounts to minimum 24 months.

Principles are specified in guarantee certificate. The service life of the centrifuge specified by the manufacturer amounts to 10 years.



After termination of guarantee period it is necessary to carry out yearly technical inspections of the centrifuge. Only service personnel authorized by manufacturer may perform the inspections.

The manufacturer reserves the right to make modifications to produced goods.

5.3. Safekeeping period.

Maximum period of storage of not used centrifuge amounts to 1 year. After this period, a service authorized by manufacturer should carry out technical inspection of the centrifuge.

5.4. Hints on centrifuging.

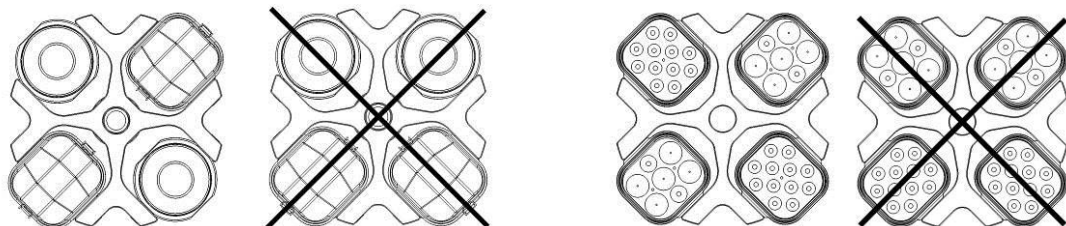


- Set the centrifuge in horizontal position on rigid base.
- Ensure safe positioning location.
- Ensure free space around the centrifuge (amounting to at least 30 cm left free).
- Ensure sufficient ventilation.
- Fix the rotor on the motor axis firmly.



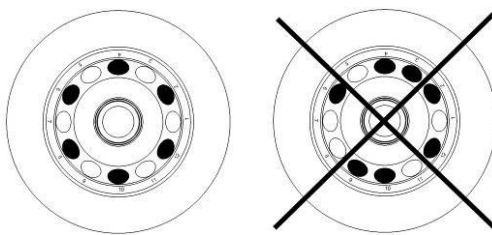
- Avoid unbalance.
- Load opposite buckets with the same accessories.
- Centrifugation of the test tubes of different sizes.

There is a possibility to centrifuge test tubes of different sizes; however, it is absolutely necessary in such cases that opposite buckets and round carriers be the same.



- Not only the test tubes shall be inserted symmetrically, but also round carriers and their hangers shall be equally loaded. It is e.g. not allowed to operate centrifuge only external part of reductive insert loaded.

-
- It is necessary to insert test tubes symmetrically on the opposite sides.



- Fill test tubes outside the centrifuge.
- Please pay special attention to the quality and proper thickness of the glass test tubes walls. Those shall be test tubes for centrifuges, of proper durability up to 5,000 x g.
- In order to protect the centrifuge against unbalance, fill in the test tubes up to the same weight.



- Lubricate the swing-out rotor journal pins.
- Use only accessories in good condition.
- Protect equipment against corrosion using accurate preventive maintenance.



- Infectious materials could be processed in closed buckets only.



- It is not allowed to centrifuge explosive and inflammable materials.
- It is not allowed to centrifuge substances prone to reacting in result of supplying high energy during centrifugation.

5.5. Hazards and precautions



- Prior to switching the centrifuge on, one shall read carefully all sections of this instruction in order to ensure smooth operation and avoid damages of this device or its accessories.

- Centrifuge shall not be operated by unqualified personnel.



- Centrifuge must not be transported with the rotor mounted on the shaft.

- One must use original rotors, test-tubes and spare parts only.



- In the case of faulty operation of the centrifuge one shall ask for assistance of service of MPW Med. instruments Company or its authorized representatives.



- It is not allowed to switch the centrifuge on if it is not installed properly or rotor is not fitted correctly.



- The centrifuge must not be operated in places where explosion hazard exists as it is not explosion-proof.
- It is not allowed to centrifuge materials capable of generating inflammable or explosive mixtures when subjected to air.



- It is not allowed to subject to centrifugation toxic or infectious materials with damaged leak proof seals of the rotor or test-tube. Proper disinfection procedures have to be carried out when dangerous substances contaminated the centrifuge or its accessories.
-



- It isn't allowed to open the cover manually in emergency procedure when rotor is still turning.



- It isn't allowed to exceed load limit set by the manufacturer. Rotors are intended for fluids of average homogeneous density equal to 1.2 g/cm³ or smaller when centrifugation is carried out at maximum speed. When fluids of higher density shall be used, then it is necessary to enter the value in the PARA fold (see point 7.5.4. "Density" and also point 7.12.3 "Maximum load").



- It is not allowed to use the rotors and round carriers with signs of corrosion or other mechanical defects.
- It is not allowed to centrifuge highly corrosive substances which may cause material impairment and lower mechanical properties of rotor and round carriers.
- It isn't allowed to use rotors and accessories not admitted by the manufacturer. Let to use commercial glass and plastic test tubes, which are destined to centrifuging in this laboratory centrifuge. One should absolutely not use poor quality elements. Cracking of glass vessels and test tubes could result in dangerous vibration of the centrifuge.



- It is not allowed to carry out centrifugation with the rotor caps taken off or not driven tight.
- It is not allowed to lift or shift the centrifuge during operation, and rest on it.
- It is not allowed to stay in the safety zone within 30 cm distance around the centrifuge neither leave within this zone some things, e.g. glass vessels.
- It is not allowed to put any objects on the centrifuge.

6. Operation of the centrifuge.

6.1. Mounting of the rotor and accessories.

1. Connect the centrifuge to the mains (master switch on left side of the centrifuge).
2. Open the cover of the centrifuge by pressing the **COVER** key. Prior to putting the rotor in, one has to check if the rotating chamber is free of impurities, e.g. such as dust, glass splinters, residues of fluids that must be taken away.
3. One shall fit the rotor on the motor shaft driving it home on the cone.
 **Caution! Fitting the rotor too shallow will result in lack of identification of the rotor after start of the centrifuge, displaying the error message (see p. 7.7.1.) and stopping the centrifuge.**
4. Screw-in the bolt for fixing the rotor (clockwise) and screw it tightly home with the supplied spanner for the rotor.
5. Swing-out rotors have to be provided with the buckets in all seats. One should remember that every buckets swings individually. Bucket suspension studs should be lubricated periodically with technical petroleum jelly.
6. In the case of rotors designed with the cover they must not be used without it. Rotor covers must be closed exactly. Rotor covers ensure smaller drags of the rotors, proper setting of the test-tubes and airtight sealing.
7. One should use only buckets intended for selected types of the rotor – see p. 2.1. "Accessories".
8. Fill test tubes outside the centrifuge.
9. Put on or screw the caps on vessels and rotors (if applicable).
10. In the case of centrifuging in an angle rotor, test tubes (buckets) have to be filled properly in order to avoid overflows.
11.  **CAUTION: Centrifuge will tolerate small weight differences occurring during loading of rotors. However it is recommended to equalize vessels loads as much as possible in order to ensure minimal vibrations during operation. When the centrifuge is started with large imbalance, the unbalance control system will switch-off the drive system and error signal will be transmitted. On the monitoring panel, error message will be displayed (see p. 7.7.1.).**
12. In order to prolong lifetime of the rotor and gaskets rotors shall be lubricated with the maintenance oil, while gaskets and threaded parts shall be lubricated with the technical petroleum jelly.
13. For replacement of the rotor one shall unscrew clamping and then grab the rotor with both hands at opposite sides, taking it away from drive shaft by pulling it up.

6.2. Construction and safety measures.

The centrifuge has rigid self-supporting structure. Housing was made of sheet aluminium, back made of steel sheet. Front and cover was made of ABS type plastic. Cover is fixed on steel axles of hinges and from the front it is locked with two electromagnetic locks blocking possible opening during centrifugation. Rotation chamber casing was made of thick steel sheet. The rotation chamber bowl is made of stainless steel sheet. Rotors and containers are from aluminium, lids from polycarbonate and reductive inserts from the polypropylene.

6.3. Drive.

Low noise induction motor constitutes the drive.

6.4. Data input and output.

Data setting and read-out system forms hermetically closed keyboard with distinctly accessible operation points. Easily readable displays signalling individual performed operations facilitate operator's programming and recording of parameters and condition of the centrifuge.

The centrifuge is provided with the RS 232 serial interface that enables connection of the centrifuge to external PC unit with the printer and recording the centrifugation parameters.

6.5. Controls.

The microprocessor control unit of the centrifuge ensures broad possibilities of providing, realisation and reading of work parameters, that is:

- selection of the spin program from the list 1÷99 (looking through of programs);
 - selection of the rotor and containers tied with him according to the accession number from the list (looking through of rotors and their parameters);
 - setting the rotational speed within 100 ÷ 18,000 rpm at 10 rpm interval;
 - setting the **RCF** with automatic calculation of the rotation speed with 10 rpm accuracy.
 - setting centrifugation time: 5 sec ÷ 9 min. 59 sec. (resolution 1 sec.)
10 min. ÷ 9 h 59 min. (resolution 1 min.)
or continuous running **HOLD**
 - selection of **SHORT** – short duration operation,
 - **Stand By** function – display unit blanking after 10 seconds of idle,
 - counting the time of the **START** key pressing or of the set speed reached;
 - displaying the increasing or reducing time by the choice,
 - selecting acceleration characteristics from 0 – quickest to 9 – slowest with displaying the time in [s],
 - selecting deceleration characteristics from 0 – quickest to 8 – slowest; deceleration characteristics number 9 is subterfuge characteristics (**with time of free stopping of the rotor in [s]**),
 - programming of optional acceleration and deceleration time,
 - programming of multi-segment characteristics of the working cycle with graphical visualisation,
 - setting the rotation chamber temperature: - 20° ÷ + 40° C (reached temperature -13°C ÷ +40°C)
- MPW-380R**
- selection of the **COOLING** option – cooling the rotation chamber after the end of centrifuging **MPW-380R**,
 - selection of the program no. 1 – cooling the rotation chamber and accessories before start of centrifuging,
 - selecting the **AUTO COVER** function – automatic opening of the cover after centrifuging is finished,
 - setting the **START DELAY** option (time settings),
 - setting the **RADIUS** option – changing of rotor radius [mm],
 - setting the **DENSITY** option – changing of sample density [g/cm³],

- setting the configuration menu access code,
- selection of menu language (polish, english, spanish)
- selection of the primary screen mode (display **SPEED+RCF** or **SPEED** only or **RCF** only),
- setting the **DATE** and **TIME**,
- preview of spinning parameters of 10 last cycles,
- preview of the total working time and quantity of the full working performed cycles,
- preview of the quantity of the working cycles and the centrifuging time for each rotors,
- possibility to switch the key signals on/off,
- possibility to register the centrifuging parameters by connecting the centrifuge to a PC with a printer or “Kawka” thermal printer,
- displaying information on emergency states.

6.6. Safety devices.

Apart from the above described passive devices and safety measures there exist as well active devices and elements as follows:

6.6.1. Cover lock.

The centrifuge can be started only with properly closed cover (the **COVER** diode is **not shining**). While, the cover can be opened only after stopping the rotor. In the case of emergency opening of the cover during operation, the centrifuge will be immediately switched-off and the rotor will brake till complete stopping. With opened cover (the **COVER** diode **is shining**), the drive is completely disconnected from the power, which makes it impossible to start the centrifuge.

6.6.2. Unbalanced load checking system.

When loads of opposite buckets or carriers in rotors are unbalanced, the drive will be switched-off during acceleration or operation of the centrifuge – and the error message will be displayed (see p. 7.7.1.).

6.6.3. Rotor installation and software compatibility verification unit.

Directly after starting centrifuging, a unit verifies the type of the rotor applied and in the case of its incompatibility with the type indicated in the application or absence of the rotor, the spinning process shall be stopped with simultaneous displaying the error message (see p. 7.7.1.). The conformity of the type of the rotor is signalled with a single audible signal.

6.6.4. Rest state inspection.

Opening of the centrifuge’s cover is possible only with the rotor in the state of rest. When the rotor is being stopped, the STOP diode is on and goes off when it is stopped.

6.6.5. Checking of excessive temperature. **MPW-380R**

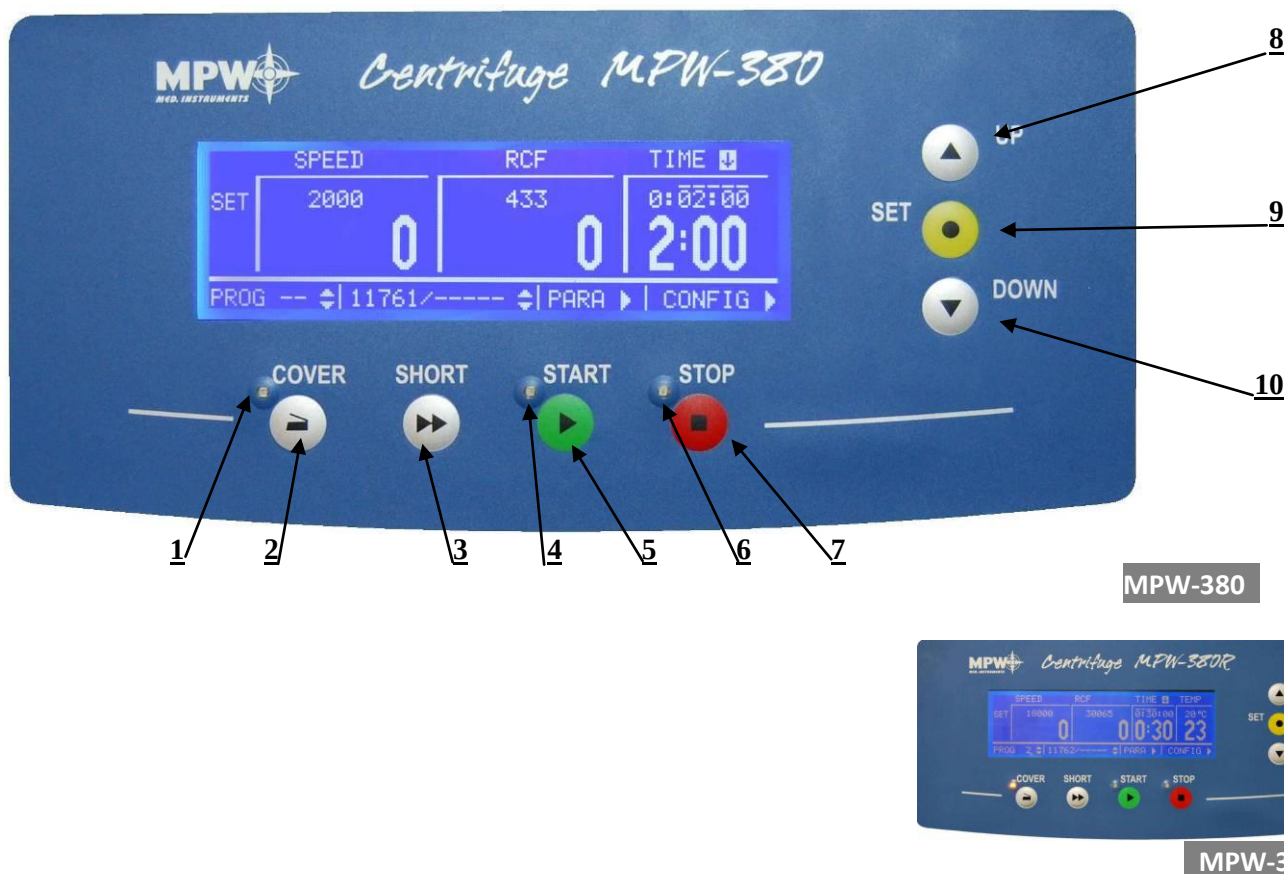
If temperature in rotation chamber exceeds 50° C caused by, for example, malfunction of cooling system, drive will be switched off and error message will be displayed (see p. 7.7.1.). The reboot is only possible after chilling the device.

7. Description of the centrifuge operating elements.

Power switching ON/OFF is carried out with master switch situated on left wall of the centrifuge. All settings on the centrifuge are done by means of the control panel. Panel comprises control keys, display and signaling LED's.

7.1. Control panel.

The control panel placed on the front casing serves the purpose of controlling centrifuge operation.



Drawing No.4. Control panel

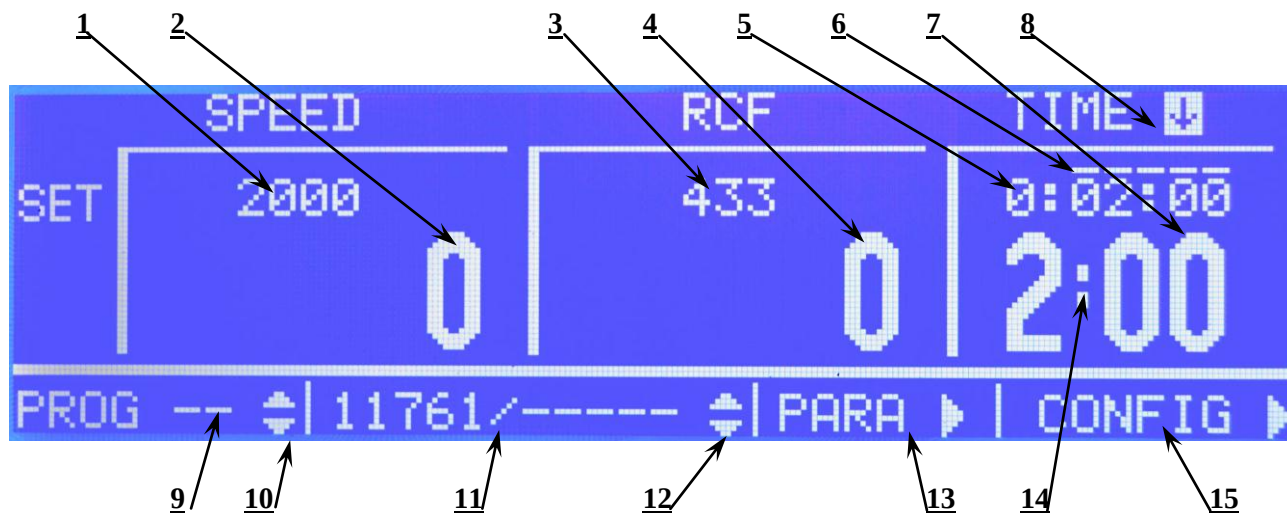
1. **COVER** diode – is on when the cover is open,
2. **COVER** key – serves for opening the cover,
3. **SHORT** key – serves for short duration work (the centrifuge is working as long as the key is pressed),
4. **START** diode – is on of the moment of pressing the **START** key until pressing the **STOP** key,
5. **START** key – starting centrifugation with programmed parameters,
6. **STOP** diode – is on of the moment of pressing the **STOP** key until the rotor is stopped,
7. **STOP** key – serves for centrifuging stopping. Single-time pressing will make stopping centrifuging with acceleration characteristics set in the software. Pressing and holding it for 1s will make the centrifuging stop quicker. During setting of the parameters, it serves for exiting zones on the primary screen without introducing changes.
8. **UP** key – serves for the zone change on the display or for increasing the edited parameter
9. **SET** key – serves for entry to the edition of parameters and confirming the set parameter
10. **DOWN** key – serves for the zone change on the display or for reducing the edited parameter

7.2. Display.

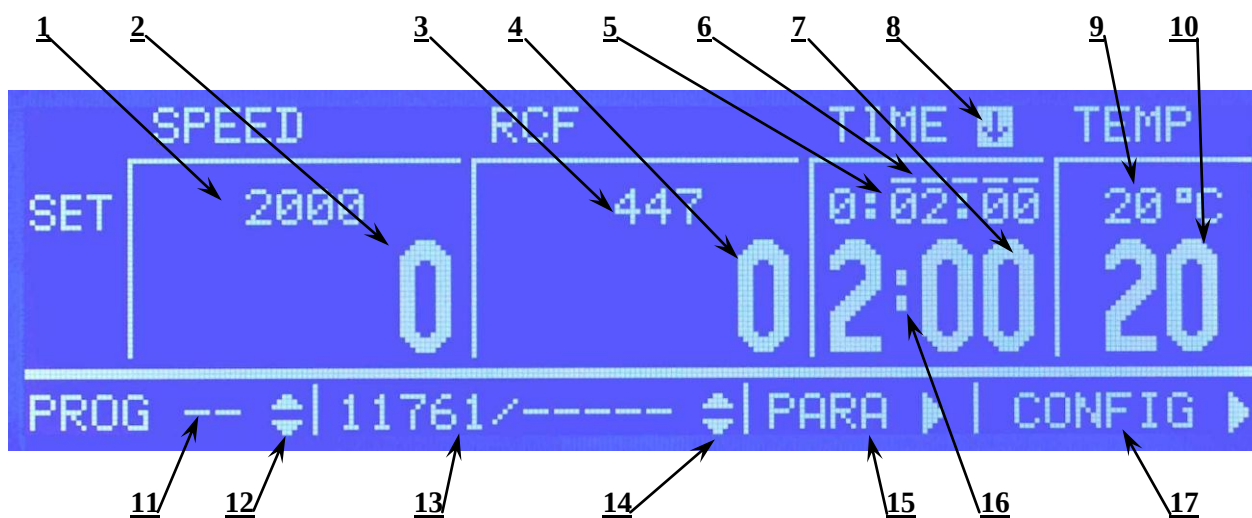
The display is located in the centre of the control panel.

The main screen is presented below for MPW-380 and MPW-380R.

MPW-380



MPW-380R

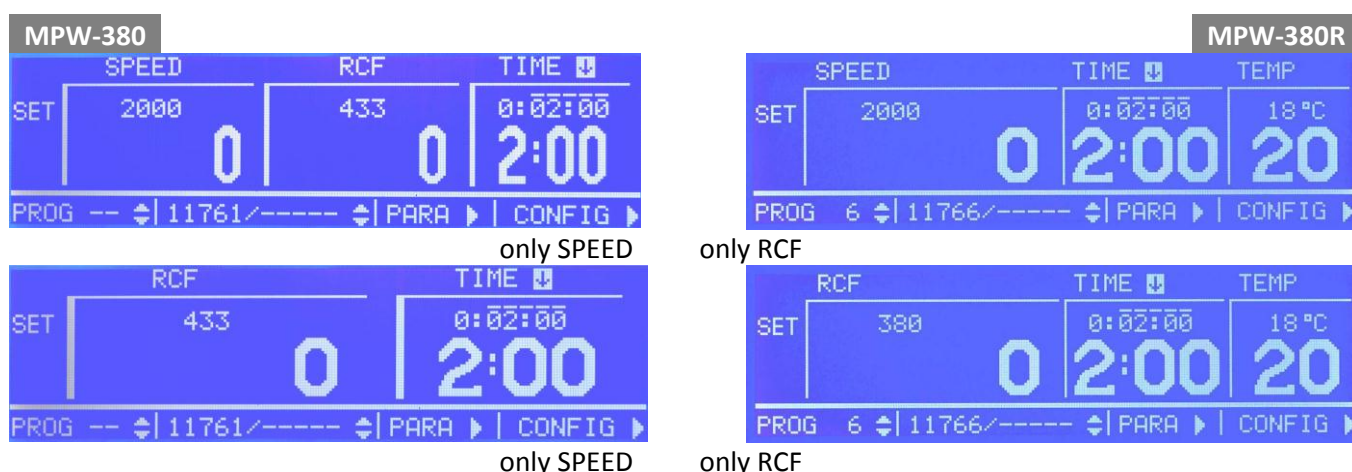


1. Assigned speed in [rpm]
2. Measured rotor speed in [rpm]
3. Assigned RCF
4. Measured RCF
5. Assigned value of the centrifuging time:
h: min : sec
6. Zone mark of assigning of the centrifuging time:
ZONE 1: 5 sec. – 9 min. 59 sec. [at 1 sec. intervals]
ZONE 2: 10 min. – 9 h 59 min. [at 1 min. intervals]
7. Centrifuging time (cursor ↑) or time remaining to end of centrifuging (cursor ↓)
8. Cursor of counting of the centrifuging time:
↑ : displaying the centrifuging time (counting upwards)
↓ : displaying the time remaining to end of centrifuging
9. Assigned temperature: **MPW-380R**
-20°C do +40°C
10. Measured temperature **MPW-380R**

11. Number of the user's program
12. List of the user's programmes
13. Number of the rotor / Number of the bucket
14. List of the rotors and buckets
15. Setting of work parameters of the centrifuge
16. Cursor of counting of the centrifuging time: the flashing dots mean counting pending
17. Configuration menu

7.2.1. Variations of the main screen

Beside displaying the mode SPEED+RCF there is a possibility to set 2 extra modes of work: displaying only SPEED or only RCF. Switching to the suitable mode takes place on the CONFIG→ SCREEN fold.



7.3. Setting up parameters

On the main screen, it is possible to set:

- **SPEED**,
- **RCF**,
- **TIME**,
- Temperature – **TEMP** **MPW-380R**,
- Selection of user's program – **PROG**,
- Selection of user's program from list (programmes browsing),
- Selection of rotor and bucket,
- Selection of rotor from list (browsing of rotors and their parameters),
- Assigning of **PARA** work parameters and **CONFIG** configuration of centrifuge.

Assigning settings takes place in two stages:

It is necessary in the first place to choose the zone, in which the parameters will be set.

Available zones: **SPEED**, **RCF**, **TIME**, **TEMP**, **PROG**, **PROG LIST**, **ROTOR NUMBER/BUCKET NUMBER**, **ROTORS LIST**, **PARA**, **CONFIG**.

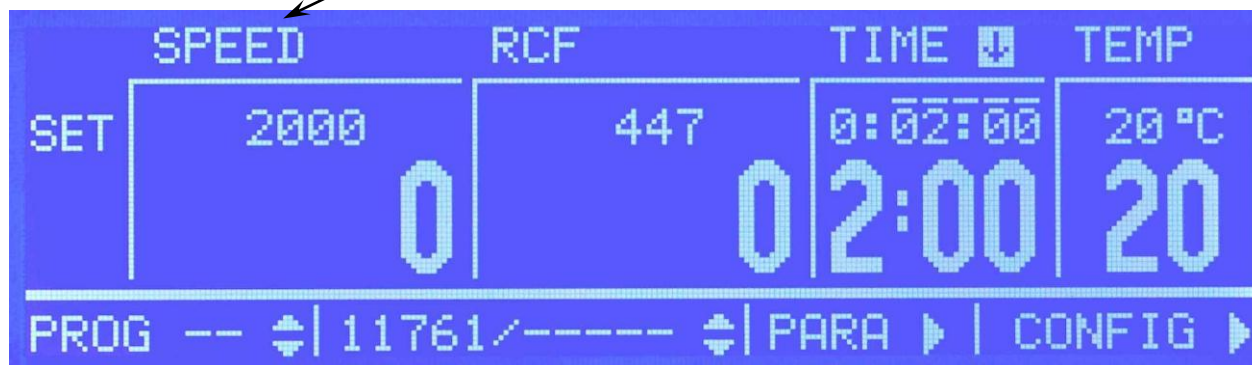
The zone is selected by pressing the **SET** key (first from chosen zones will begin to blink; it is **SPEED** or **RCF** depending on the mode of work of the screen), and choosing the suitable zone with **UP** or **DOWN** keys.

After choosing the zone, pressing the **SET** key again will cause proceeding to parameters setup. The settings may be changed with keys **UP** and **DOWN** accordingly. Pressing the **SET** key ends the setting and causes the chosen value to be entered to the driver's register.

Exemplary change of TIME settings:

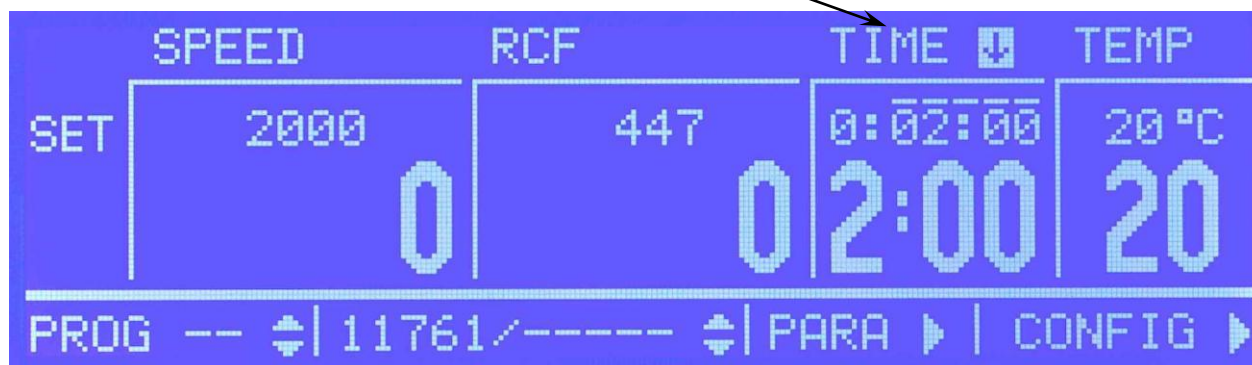
a) press the SET key

First zone (**SPEED**) will
begin to blink



b) press the UP key two times (selection of TIME zone)

Blinking TIME zone



c) press the SET key (starting the change setup in the TIME zone)

The **SET** inscription is highlighted:
mode of programming setups in the
chosen zone

Blinking altarpiece
undergoing a change



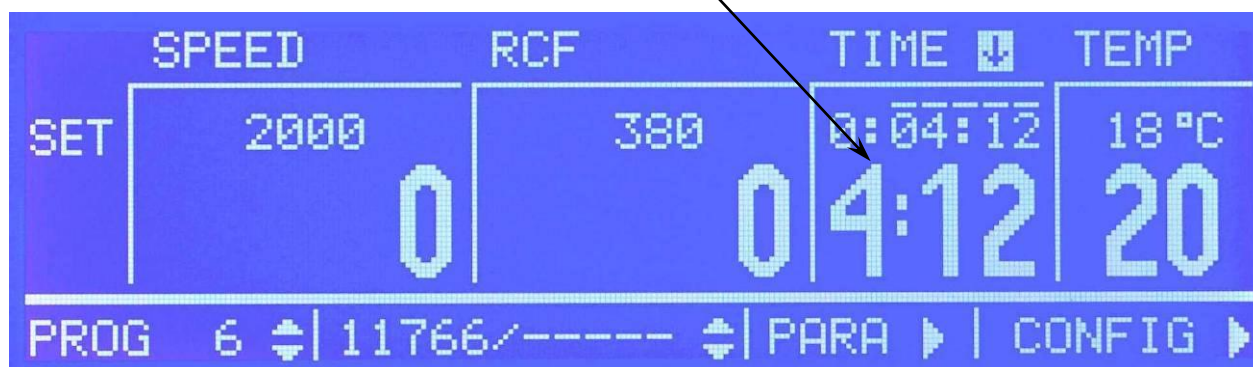
d) increase or decrease the setup value with UP and DOWN keys. Pressing in and supporting the key longer than the second makes switching on repetition of key. If the key is still pressed for another 3 seconds, the speed of repetition is growing three times.

New value of **TIME** setup
e.g. 4min.12sec.



e) pressing the SET key ends setting the new value of the centrifuge time

New value of the centrifuge time
is entered to the time-meter



7.4. Description of zones

7.4.1. Speed

Rotational speed of the rotor. Set from 100 rpm (speed of identification of rotors is 85 rpm) to the maximum, admissible rotor speed. The settings are changed with UP and DOWN keys, in 10 rpm interval. Pressing and holding a key longer than one second switches the repetition on. If the key is still pressed for another 3 seconds, the speed of repetition grows ten times (to 100 rpm.).

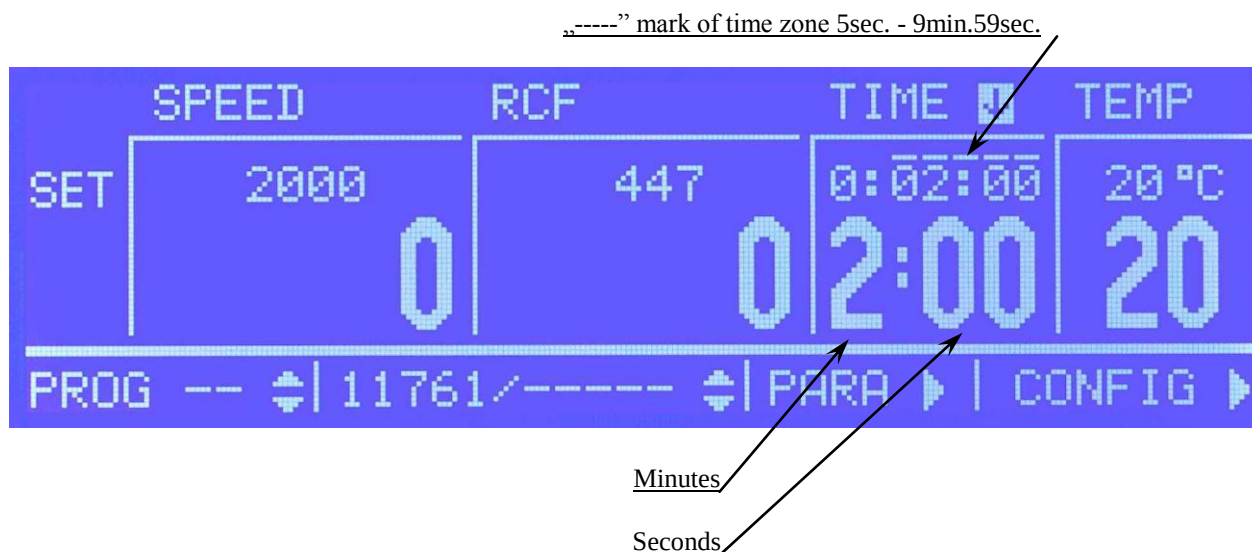
7.4.2. Rcf

The RCF calculation function is highly non-linear, hence setting the RCF takes place stepwise as per every 10 rpm.

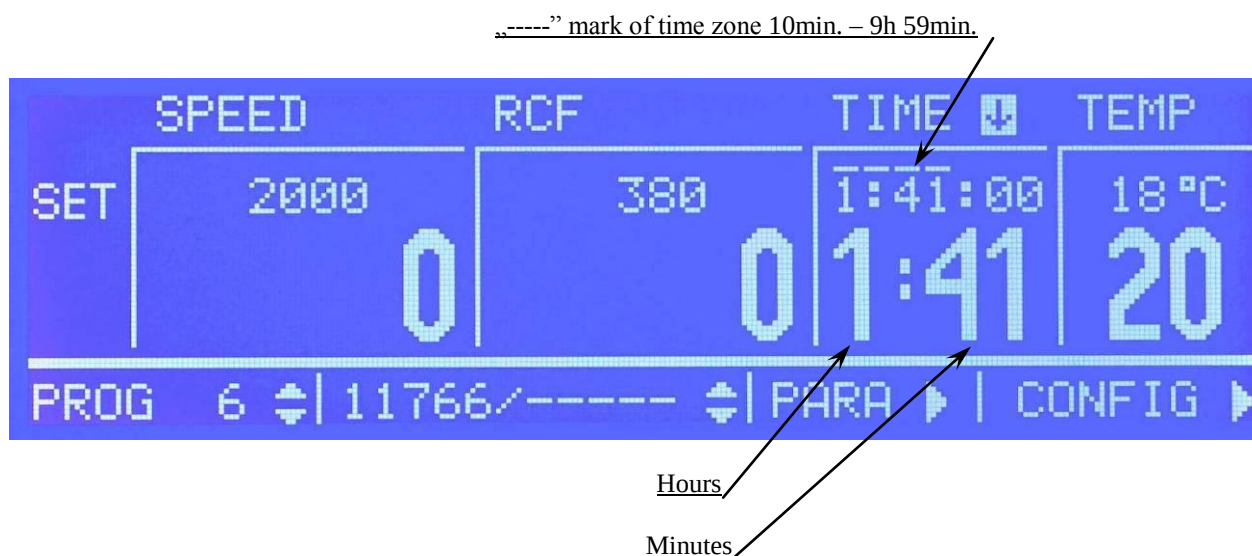
7.4.3. Time

Setting the centrifuging time is divided into 3 zones:

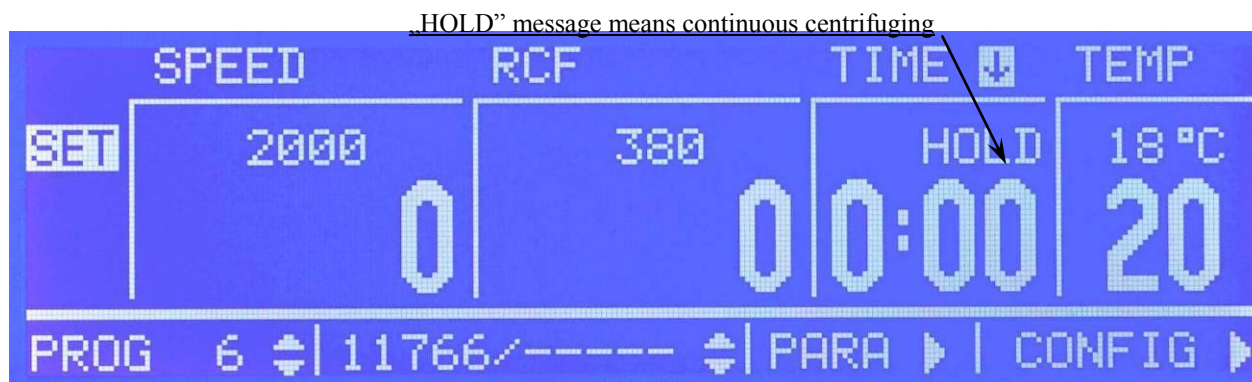
I) range from 5 sec. to 9 min. 59 sec. by 1-sec. intervals. Setting in this zone is marked by “-----” mark under “min: sec” values .



II) range from 10 min. to 9 h 59 min. in 1 min. interval. Setting in this zone is marked by “-----” mark under “h: min” values.



III) range of continuous work of the centrifuge (unlimited centrifuging time). When setting the centrifuging time longer than 9 h 59 min, instead of centrifuging time, the "HOLD" message is being displayed. It means that the centrifuge will be working until pressing the **STOP** key.



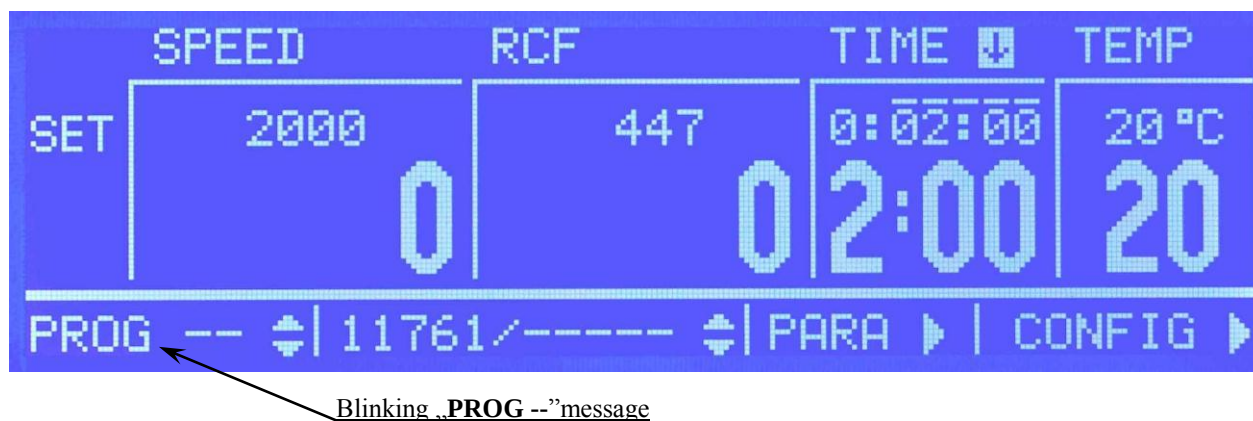
7.4.4. Temp (Temperature) MPW-380R

Setting the temperature within the range from -20 °C to +40 °C, by 1 °C interval.
(reached temperature -13°C ÷ +40°C)

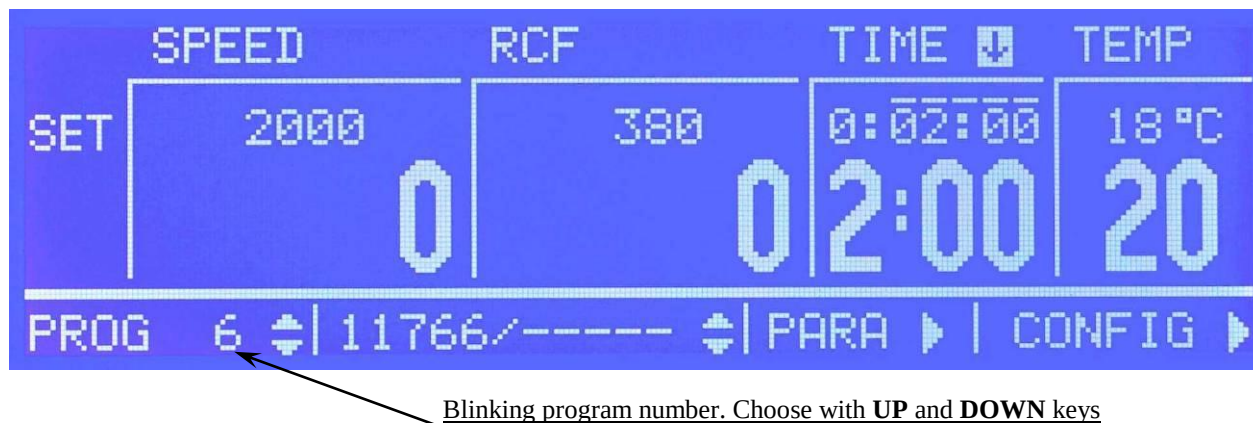
7.4.5. Prog (User's programs)

Range of programs: from 1 to 99. The program chosen most recently is activated automatically when turning on the centrifuge. If none program was chosen or in the case of a change of the parameter without saving, the "--" sign is being displayed. In order to select the program:

- choose the PROG zone (press the **SET** key, chose zone with **UP** or **DOWN** keys; "**PROG --**" message will begin to blink)



1. press the **SET** key and proceed to the selection of the program number ("--" sign or program number will begin to blink). With **UP** or **DOWN** keys choose the program number.



- finish setting the program number with the **SET** key.

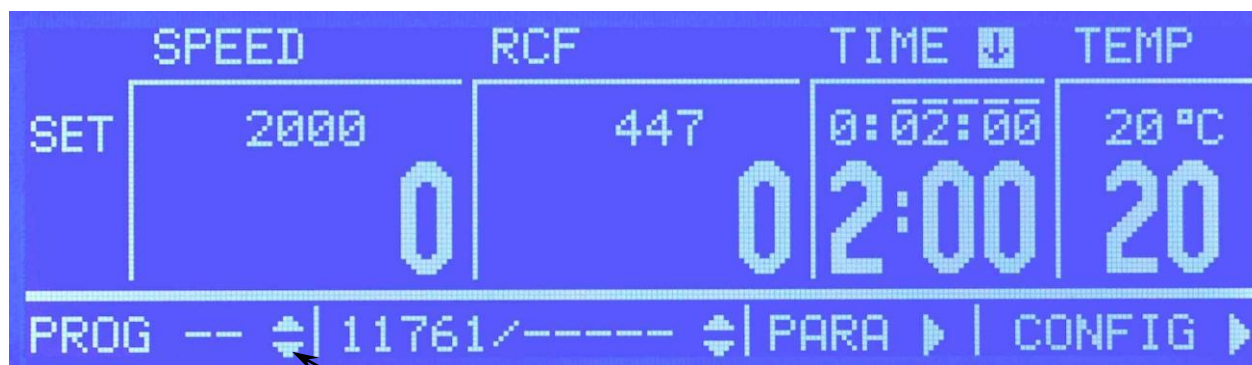
The only possibility to stop of the program used recently is removing it from the list of programs (see p. 7.4.6) or setting another program.

7.4.6. List of the user programs

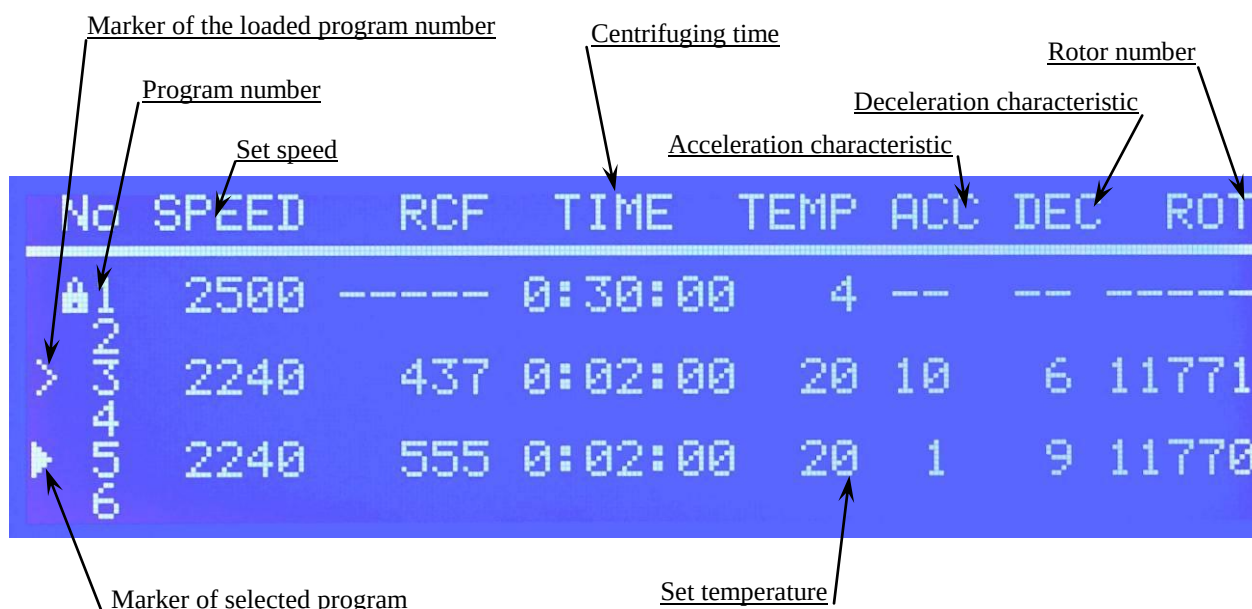
The centrifuging parameters: **SPEED**, **RCF**, **TIME**, **TEMP**, acceleration characteristics, deceleration characteristics and rotor number may be saved and then loaded by the user (saving as one of 99 available programs).

In order to browse the list of programs:

- choose the **PROG** zone (press the **SET** key, chose zone with **UP** or **DOWN** keys; cursor of PROGRAM LIST will begin to blink)



- press the **SET** key and proceed to browse the list of programs

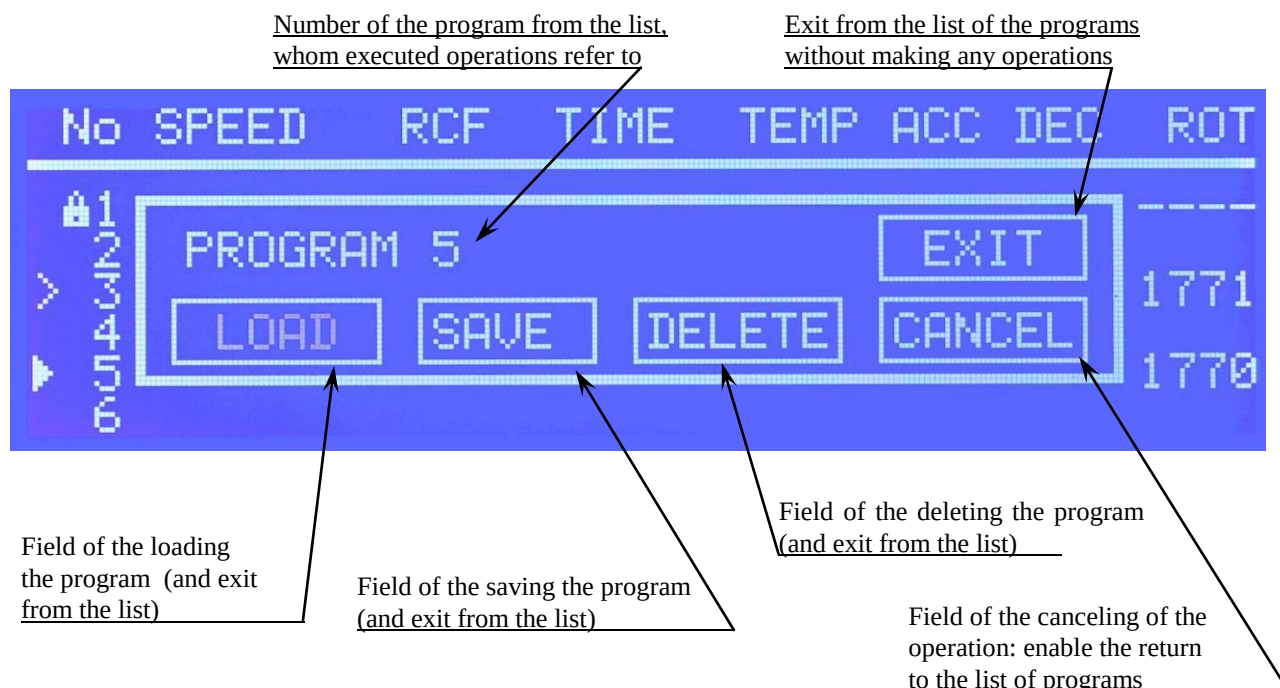


ATTENTION!

In case of deleting all user programs, when **no. 1** program is currently active (default program), please follow the instructions below before continuing:

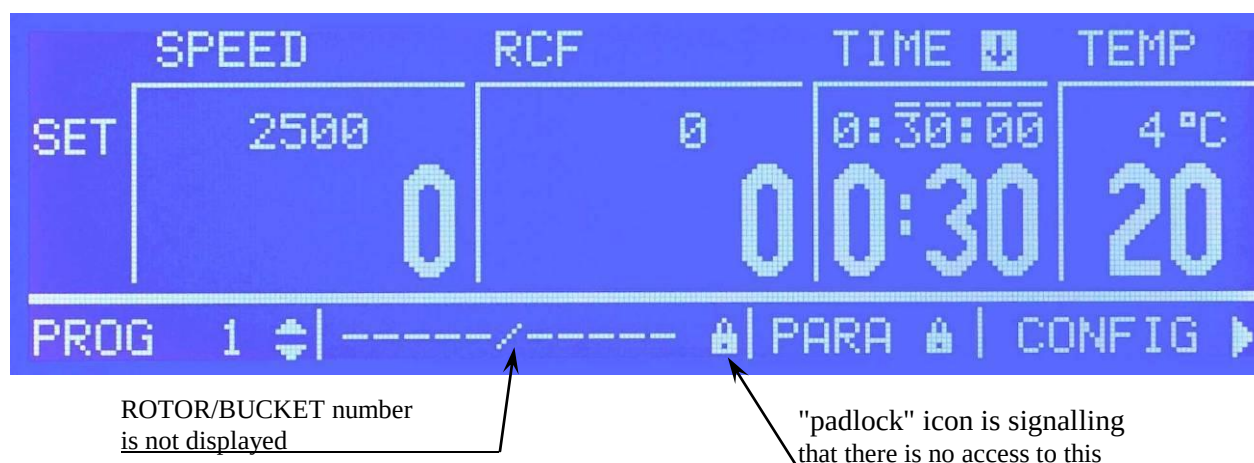
- enter the **List of user programs** ,
- select **no. 1** program ,
- press **SET** key,
- choose **DELETE** option.

- In order to save, load or delete a user program one should use **UP** and **DOWN** keys to set the indication marker by the chosen number on the list and then press the **SET** key. A selection window will appear (example: operations on the number 5 on the list):



7.4.7. Program of preliminary refrigerating **MPW-380R**

Special program no. 1. It is a program intended for preliminary cooling of rotors, irrespective of the kind of a rotor. Centrifuging operates with parameters: SPEED: 2500 rpm, TIME: 30 min, TEMP: +4 °C. The program is marked with the "padlock" icon which means that it is not possible to modify it or to save it if it was loaded. Additionally, after loading this program, any changes in zones: SPEED, RCF (it is not calculated, in this section 0 is being displayed), TIME, TEMP, ROTOR_LIST, PARA will be blocked. Blocked access to these zones is signalled with "padlock" icons:



If program no. 1 is loaded, then in order to remove it from driver memory it is necessary to load other program or execute the operation of deleting (see p. 7.6.9.).

As opposed to standard user programs, program no. 1 will not be deleted from the list of programs but it will be only removed from the memory of the driver of centrifuge, and default settings will be loaded.

There is a possibility to save the adjusted program by the same number: virtually, it means the necessity to draw the attention to the number of the program being saved, because there is a possibility of accidentally overwriting saved values with new ones. Operation of deletion of the program is being realized only in the case of numbers with programs saved.

If no key will be pressed within 20 seconds, the device will automatically return to the main screen.

7.4.8. Changing acceleration/deceleration characteristics (numbers ACC/DEC 10 ÷ 19)

Loading a modified program in the **CURVES** fold is signalled by the icon on the main screen:

Icon that signals loading of the program (in this case no. 5) in which at least one of characteristics acceleration/deceleration parameters was modified by the user (it has a number from 10 ÷ 19)



Since curves created by the user are connected with the number of the rotor and the value of speed set, loading of a program modified in such a way is subject to certain limitations. There is no possibility to change set speed and the rotor number (even when the centrifuge is not working). It is possible to modify the number of characteristics connected with the program in the **PARA** fold; setting **ACEL** and **DECEL** within the range 0 - 9 switches centrifuging process to default characteristics and the limitations are no longer applicable.

7.4.9. Rotor/ Bucket

It is possible to select the number of the rotor and the number of a relevant container directly on the main screen. In order to do so:

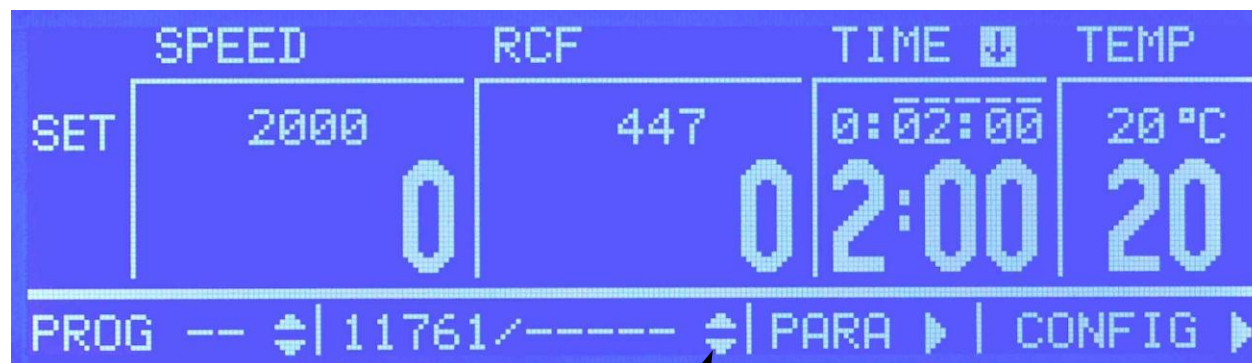
- choose the **ROTOR/BUCKET NUMBER** zone (press the **SET** key, choose the zone with **UP** or **DOWN**; "rotor number/bucket number" will begin to blink)
- press the **SET** key and choose the right rotor with **UP** / **DOWN** keys
- save the choice through pressing the **SET** key again

7.4.10. List of rotors

It is possible to select the rotor and the container in a more comfortable manner – namely, from the list. The list of rotors contains all data connected with particular rotor.

In order to browse the list one should:

- choose the **LIST OF ROTORS** zone (press the **SET** key, choose zone with **UP** or **DOWN** keys; marker of zone will begin to blink)



Blinking marker of LIST OF ROTORS

- press **SET**: the screen with the list of available rotors will be displayed:

NO	ROTOR	BUCKET	SPEED	RCF	RMAX	RMIN
4	11764		16400	28566	95	40
5	11765		16400	29468	98	40
> 6	11766		18000	30790	85	40
7	11767		14000	20598	94	40
◀ 8	11770		14000	21694	99	40
9	11771		18000	28254	78	40

Annotations:

- Marker of the rotor used currently (points to rotor 4)
- Rotor number (points to column header)
- Number of the container connected with a given rotor (points to BUCKET column)
- Rotor radius: maximum Rmax and minimal Rmin (points to RMAX and RMIN columns)
- Marker of the chosen rotor (points to rotor 8)
- Maximum speed of rotor (points to SPEED column)
- Maximum RCF of rotor (points to RCF column)

- with **UP** and **DOWN** keys, put the indication marker by the proper number of the rotor
- confirm the choice of the rotor with the **SET** key (the device will return to the main screen)

7.5. Para – zone of setup of operations’ parameters

Choose **PARA** zone (press **SET**, choose **PARA** zone with **UP** / **DOWN** keys , press **SET**). The screen with parameters of centrifuging will appear.

During centrifuging, it is possible to change the settings in following folds:

- ACCELERATION** – number of acceleration characteristic
- DECELERATION** – number of deceleration characteristic
- COOLING** – cooling of the centrifuge chamber **MPW-380R**
- OPEN LID AFTER RUN** – automatic opening of the cover after the centrifuging is finished
- START DELAY** – delayed **START** of centrifuging

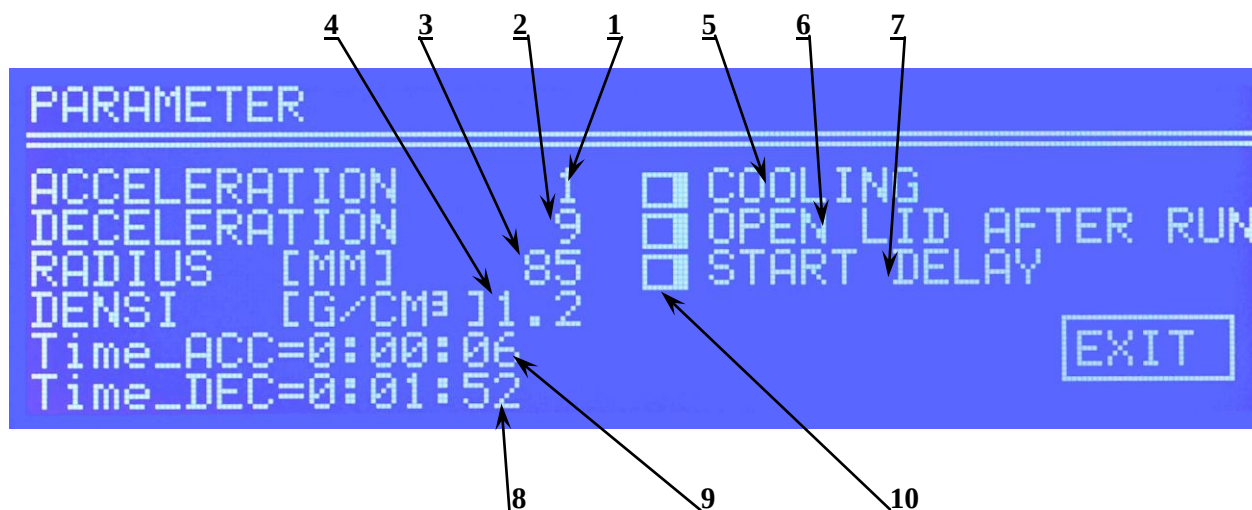
During centrifuging, it is not possible to change the following settings:

- RADIUS** – rotor radius [mm]
- DENSI** – sample density [g/cm³]

PARAMETER	
ACCELERATION	1
DECELERATION	9
RADIUS [MM]	85
DENSI [G/CM ³]	1.2
Time_ACC	0:00:06
Time_DEC	0:01:52
COOLING	☐
OPEN LID AFTER RUN	☐
START DELAY	☐
EXIT	

Shall no key be pressed within 20 seconds, the device will automatically return to the main screen

7.5.1. Description of the function in the Para fold



1. Number of acceleration characteristic.
2. Number of deceleration characteristic.
3. Rotor radius [mm].
4. Sample density.
5. **COOLING** – cooling of the centrifuge chamber. **MPW-380R**
6. Automatic opening of the cover after the centrifuging is finished.
7. Delayed **START** of centrifuging.
8. Total time of the deceleration of centrifuge calculated on the basis of the chosen number of characteristics (0-9), the assigned speed and chosen rotor. In case of the user's characteristics (numbers 10-19) it is total time of all sections of programmed deceleration characteristics. Displayed in the format h : min : sec.
9. Total time of the acceleration of centrifuge calculated on the basis of the chosen number of characteristics (0-9), the assigned speed and chosen rotor. In case of the user's characteristics (numbers 10-19) it is total time of all sections of programmed acceleration characteristics.
10. Selection field: if empty, the function connected with it is disabled.

7.5.2. Acceleration and Deceleration characteristics.

Characteristics of 0-9 numbers are linear and present the pace of changes of the rotational speed of the rotor per second.

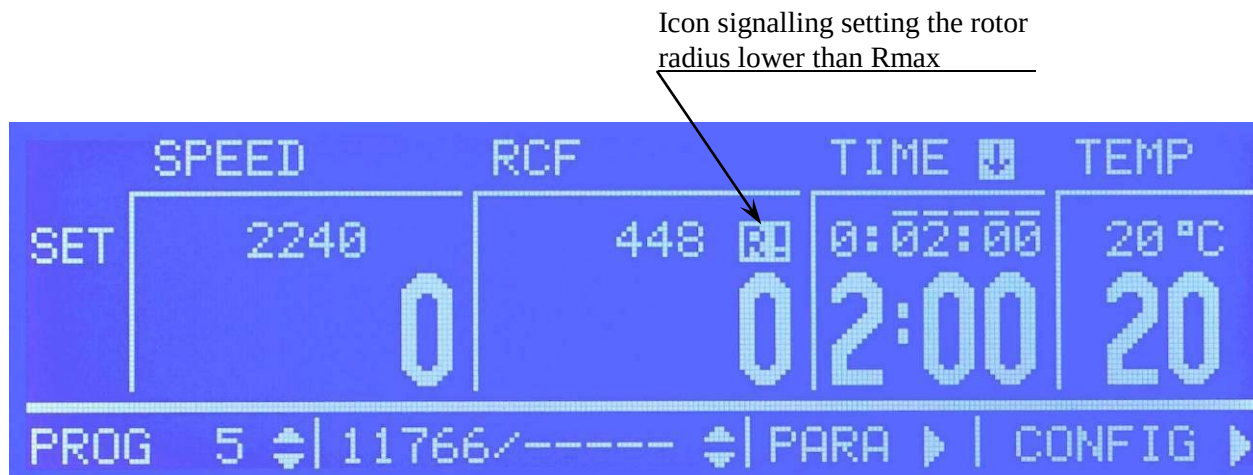
Each rotor features acceleration and deceleration characteristics, matched experimentally.

Characteristics of 10-19 numbers are set by the user as 1, 2, 3 or 4-segments characteristics. It is being done through the edition of the user's saved program in the **CURVES** fold.

If a program with the user's characteristics (10-19) is loaded, there is a possibility to change these characteristics to default ones, from the range 0-9, and then return once again to the user's characteristics.

7.5.3. Radius

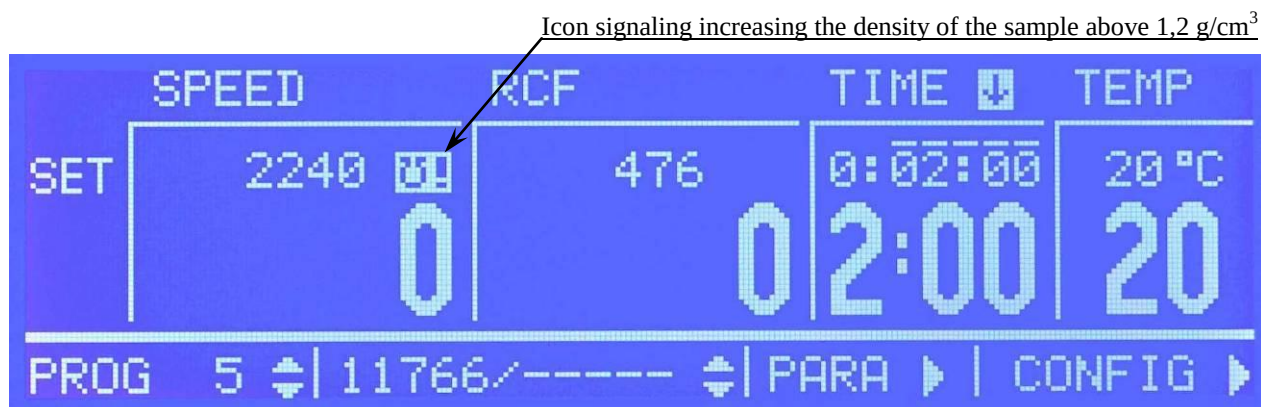
Control of the radius of the rotor within the range from Rmin to Rmax of the rotor. The change of the radius of the rotor will result in displaying the adjusted RCF value on the main screen, thus reducing the radius below Rmax is signalled with the icon in the RCF section of the main screen:



Reducing of the rotor radius (and the resulting change of displayed RCF value) applies until switching off the power supply of the centrifuge or setting the Rmax maximum radius once again (loading the program does not change this setting!).

7.5.4. Densi – sample density

Standard density of the sample is 1.2 g/cm³. It is possible to set another density within the range from 1.2 for 9.9 g/cm³. Increasing this setting above 1.2 g/cm³ limits maximum set centrifuging speed. At the same time, a relevant marker is displayed on the main screen:



Increasing density of the sample above 1.2 g/cm³ (and limiting of the maximum speed of centrifuging resulting from it) applies until switching off power supply of the centrifuge or setting the device back to 1.2 g/cm³.

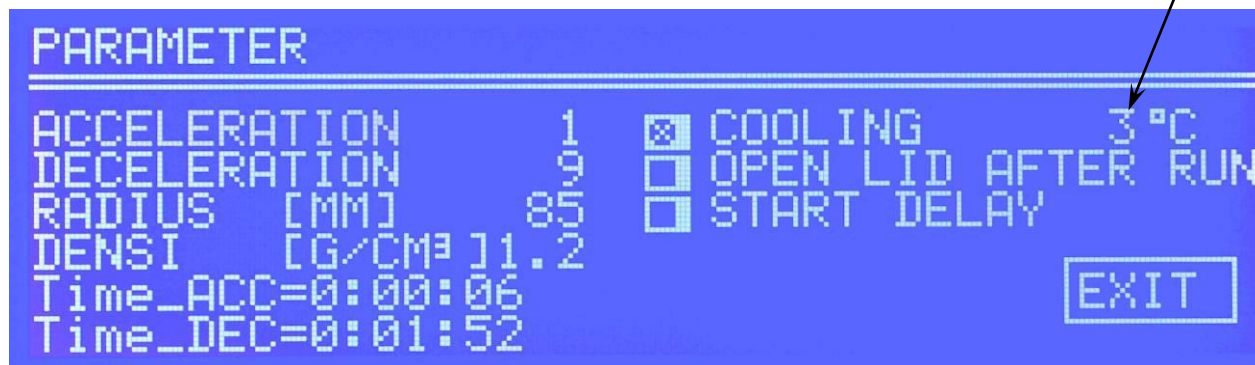
7.5.5. Cooling – refrigerating of the centrifuge chamber MPW-380R

Checking on this function will cause switching to the **TEMP_cooling** mode, in which it is possible to set the cooling temperature.

Set the temperature with **UP** and **DOWN** keys within the range from 0 to ambient temperature.

SET key confirms the setting.

The temperature set by **COOLING** function
range setup from 0 for ambient temperature



The **COOLING** function is operating in the following way: the temperature set on the **PARAMETER** fold of the **COOLING** function is being stabilized during the stoppage of the centrifuge. It is being signalled with the icon "C" on the main screen. Opening the cover switches the compressor off. Closing thereof enables stabilization of the temperature again. After starting the centrifuging the device proceeds to the stabilization of temperature set in the **TEMP** zone (within range -20 to +40 °C)

Icon displayed when **COOLING** function is enabled

Temperature of the **COOLING** function set in the
PARAMETER fold



*If the **COOLING** function is checked off, then during the centrifuge's stoppage the access to settings in the **TEMP** zone on the main screen is blocked (the set temperature with **COOLING** function is displayed here).*

7.5.6. Open lid after run – Automatic opening of the cover after the centrifuging is finished

Checking on this function will cause automatic opening of the cover, if the centrifuging cycle proceeded without interferences (the full centrifuging time was counted down). In the case of early stopping of the centrifuge (pressing the **STOP**, **SHORT** keys or emergency switch off due to enabling the secure mechanisms) the cover will remain closed and it will be possible to open it only with the **COVER** key.

7.5.7. Start Delay – delayed start of centrifuging

If this function is checked on, then after pressing the **START** key will the set time will be counted down and then the centrifuging will be launching. Time range: from 0 (without start delaying) to 9 hours and 59 minutes. Waiting for counting down the time of the delay is signalled by the blink of **START** diode (similarly as in the case of the **COOLING** function). It is possible to abandon counting at the any moment, by pressing the **STOP** key.



Delay time in the format [h : min. : sec.]
Setting by **UP** and **DOWN** keys

7.6. Config – configuration menu of the centrifuge

Upon choosing the **CONFIG** zone and confirmation with the **SET** key, the **CONFIGURATION** menu will be displayed. With **UP** and **DOWN** keys one may choose the fold (blinking message) and with the **SET** key, confirm beginning of the configuration of selected fold.



Folds in the **CONFIGURATION** menu

CONFIGURATION exit field

7.6.1. Password, locks

Setting or changing the PASSWORD

To prevent from an unauthorized use, a **PASSWORD** can be set.
Note: No PASSWORD is set by default.
The PASSWORD can be set as follows when the rotor is at a standstill.



- Press the **UP** / **DOWN** keys until **"PASSWORD:"** blinks.
- Press **SET**.
- With the **UP** / **DOWN** keys set the valid 1000s place of the PASSWORD. e.g.: **1xxx**
- Press **SET**.
- With the **UP** / **DOWN** keys set the valid 100s place of the PASSWORD. e.g.: **12xx**
- Press **SET**.
- With the **UP** / **DOWN** keys set the valid 10s place of the PASSWORD. e.g.: **123x**
- Press **SET**.
- With the **UP** / **DOWN** keys set the valid 1s place of the PASSWORD. e.g.: **1234**
- Press **SET**.



- As a confirmation repeat instructions described above.

When the PASSWORD is set, the Key sign is displayed in the CODE zone. It is also displayed in the main menu (lower right corner of the screen).



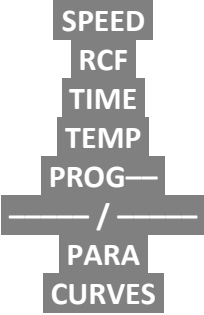
From this moment **CONFIG** menu is protected.



To delete the PASSWORD, **"0000"** must be set.
If the **PASSWORD** is forgotten, the emergency code **"7654"** should be used to clear password and remove all locks.

CODE – locks

	- With the UP / DOWN keys choose a lock. - Mark a lock by pressing SET. (the chosen lock will be marked with “x”)
---	---

	DISABLED *	description
SAVE PROGRAM	 button	- no programs can be saved - acceleration characteristics can not be saved - deceleration characteristics can not be saved
DELETE PROGRAM	 button	- no programs can be deleted - saving programs on position where one was already stored is disabled
CHANGE PARAMETERS		parameters can not be modified
LOAD PROGRAM	 button	no programs can be called up
START KEY	 key	centrifugation can not be started

* Executing disabled procedures is only possible after entering the PASSWORD .

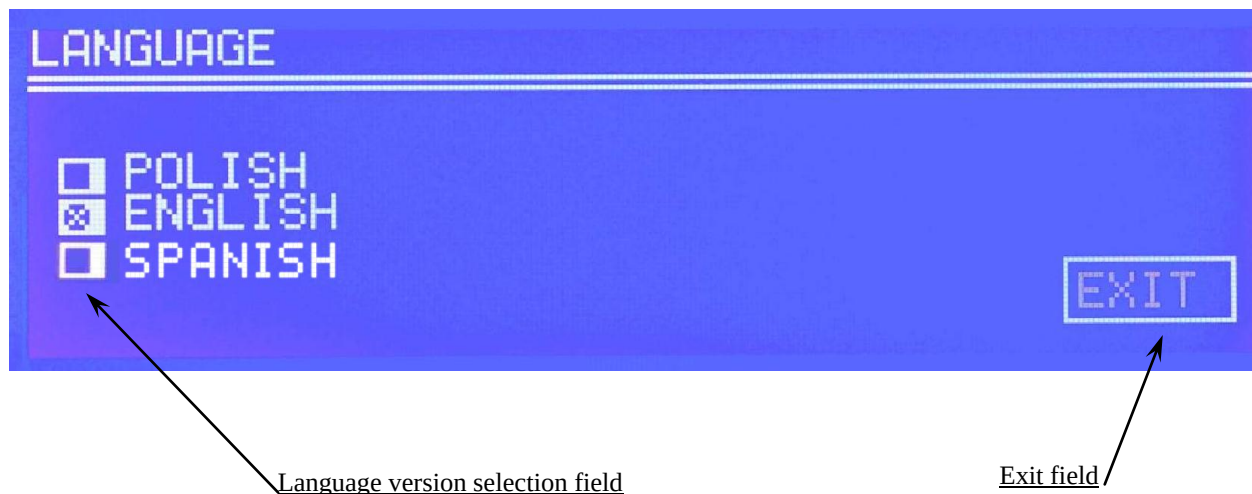
Using LOCKS described above, it is possible in any configuration.

7.6.2. Language – choice of the language

Choice of the language option as regards messages displayed by the driver.

With **UP** and **DOWN** keys, check the demanded option (the chosen language version is blinking) and press the **SET** key. The selection field by the chosen language version will be checked.

Shall no key be pressed within 20 seconds, the device will automatically return to the main screen.



7.6.3. Screen – choice of the mode of the basic screen

3 modes of the main screen operation may be selected (see p.7.2.1):

- displaying **SPEED+ RCF** (standard digits on LCD)
- displaying only **SPEED** (increased digits)
- displaying only **RCF** (increased digits)

Options are set with **UP** / **DOWN** keys, and the **SET** key.



Shall no key be pressed within 20 seconds, the device will automatically return to the main screen

7.6.4. Time / Date – setting the time and date

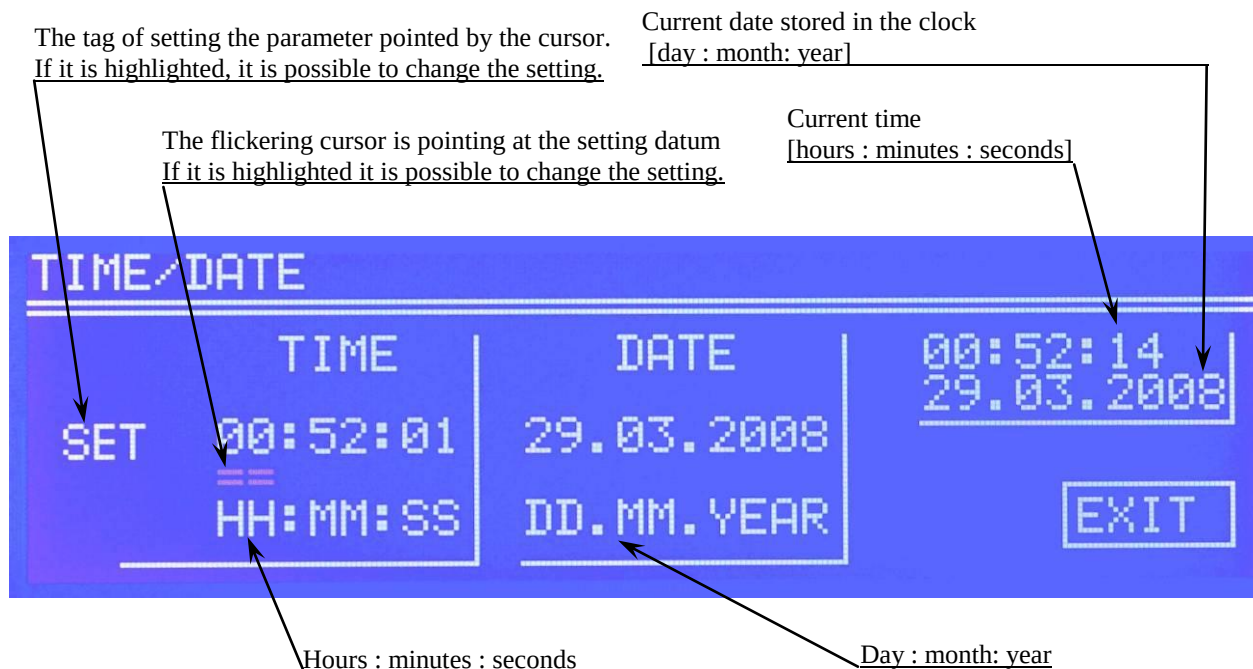
The driver is fitted with the real time clock (RTC), with battery support.

TIME / **DATE** fold serves the purpose of setting the current time and date. In the S-RAM clock memory there is also information stored on the quantity of centrifuging cycles and the total time of work of the centrifuge.

In order to set the time, use **UP** and **DOWN** keys to set the blinking cursor by the datum which is to be changed (hours, minutes, seconds, day, month, year) and press the **SET** key. The **SET** message on the display will be highlighted and at the same time the cursor will stop to blink.

Now with **UP** and **DOWN** keys it is possible to change the value of the chosen parameter, indicated by the cursor. It is necessary to confirm the change by pressing the **SET** key.

Shall no key be pressed within 20 seconds, the device will automatically return to the main screen



7.6.5. CYCLES – working time

The screenshot shows a blue screen with white text. At the top, it says 'CYCLES'. Below this, it shows 'RUN TIME: 0(H) 0(M) 0(S)' and 'CYCLES: 0'. At the bottom, there is a warning message 'WARNING: WORKING 2000 HOURS' with a small 'x' icon to its left. To the right of the warning message is an 'EXIT' button.	In the CYCLES menu the following statistics are displayed: - total working (centrifugation) time - working cycles counter When the total working time is greater than 2000h, the warning splash screen will be displayed every time the centrifuge is switched on. In that case the centrifuge should be examined by the manufacturer's service. Warning message can be disabled. In order to it follow the instructions below: - With the UP / DOWN keys choose WARNING: WORKING 2000 HOURS. - Press SET until „x” disappears. - Choose EXIT. Note: The CYCLE WARNING MESSAGE is turned on by default.
---	--

In this fold, the total working time of centrifuge is being displayed (hours: minutes: seconds) and the number of working cycles. Exit the fold by pressing the **SET** key, or it by closed automatically after 20 sec.

If centrifuging will be stopped from any reasons within the set time, such a cycle is not counted up.

7.6.6. Rotating time – parameters of the centrifuging time

This fold enables the selection of the way of counting the set centrifuging time.

- the time may be counted from the moment of pressing the **START** key or from the moment when the rotor reaches a set assigned speed
- it is possible to choose whether the time of centrifuging shall be the displayed [increasing time count] or the time remaining centrifuging time [decreasing time count]

The selection takes place by pressing **UP** or **DOWN** key (the marked parameter is blinking) and pressing the **SET** key. Choosing of the work parameter is indicated by checking on its field.



Shall no key be pressed within 20 seconds, the device will automatically return to the main screen

7.6.7. Buzzer

The fold makes it possible to switch on (**ON**) or switch off (**OFF**) short audible signals accompanying every pressing of any key.

Warning signals connected with error occurrence, cannot be switched off.

Shall no key be pressed within 20 seconds, the device will automatically return to the main screen.



The selection takes place with **UP** or **DOWN** key (the marked option is blinking) and the **SET** key. The field of the chosen option will be checked on.

7.6.8. Sensor – diagnostics of sensors and components errors

The fold is intended for the manufacturer's servicing, in case errors in operations of the centrifuge occur. The state of the variable containing information about errors arisen in working of the driver, sensors and components connected with the driver is presented here.

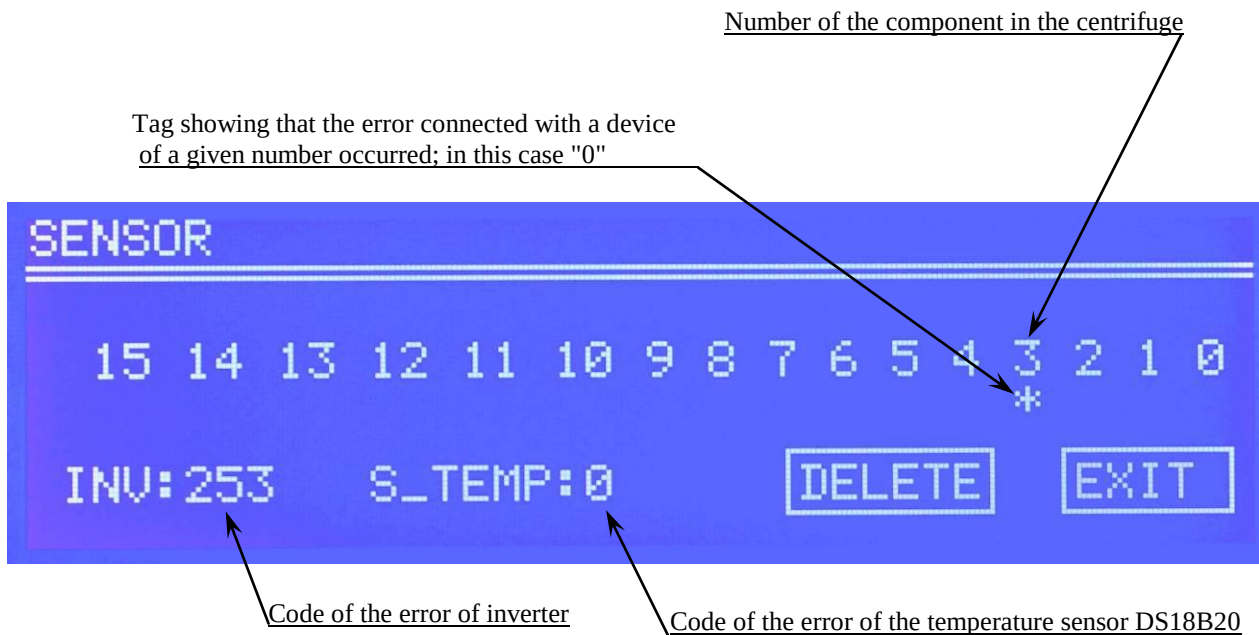
Data from this fold are saved in the durable memory until showing up of a new error. Then, they will be updated (overwritten).

In any moment, it is possible to delete the contents of the fold. For this purpose, one should choose the **DELETE** field with the **UP** key (blinking when marked) and to confirm, by pressing the **SET** key.

To exit the fold, press the **SET** key, when **EXIT** field is blinking.

Shall no key be pressed within 20 seconds, the device will automatically return to the main screen.

Exemplary **SENSOR** screen:



Device No:

- 0
- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10
- 11
- 12
- 13
- 14
- 15

type of the error:

- error of the temperature sensor TEMP0 [connector X2]
- error of the temperature sensor TEMP1 [connector X6]
- error of the temperature sensor TEMP2 [connector X8; reserve]
- error of the inverter (calling with signal BETRIEBSBEREIT=1)
- overheating of the slowing down resistor
- overheating of the motor
- cover open during centrifuging
- pressure control actuation
- the speed sensor is out of operation [impulses are missing]
- speed during identification of the rotor other than 85 rpm
- error of the transmission of the connection I2C
- rotor unbalanced
- error of inverter – driver communication
- overheating of the centrifuge above 50 °C
- unused
- unused

With errors of temperature sensors [0,1,2 numbers] the code of the resultant error is tied additionally:

- C_TEMP : 0** without error
- C_TEMP : 170** the DS18B20 sensor didn't answer 5 orders 1-WRESET
- C_TEMP : 171** incorrect checksum of data received from the sensor

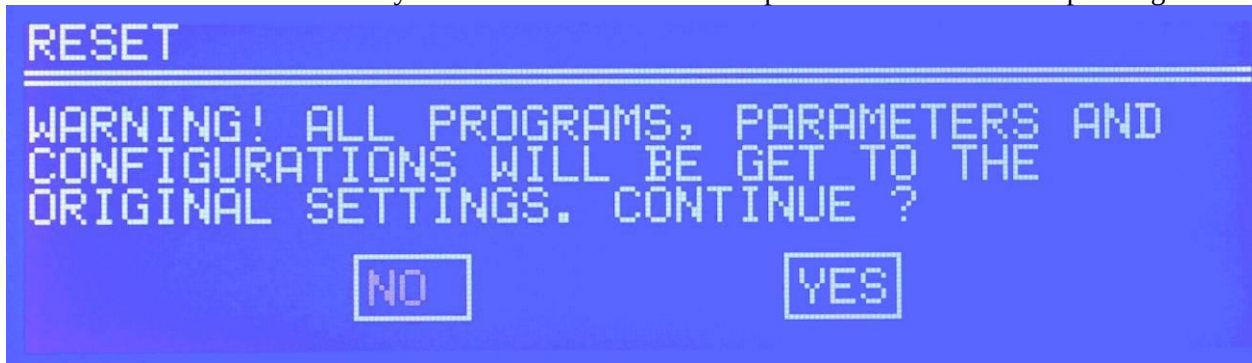
With errors referring to the inverter [3 and 12 numbers] the code of the error is additionally connected:

- FAL : 0** without error
- FAL : 1** too low voltage of the intermediating circuit
- FAL : 2** too high voltage of the intermediating circuit
- FAL : 4** too high temperature of the radiator of the inverter
- FAL : 5** exceeding of the temperature of the motor
- FAL : 9** current overload 1
- FAL : 10** current overload 2
- FAL : 13** short circuit
- FAL : 16** the work permit is missing (FREIGABE)
- FAL : 17** TIME – OUT of the RS485 connector
- FAL : 18** start with the incorrect direction
- FAL : 19** exceeding of the speed (overdrive)

FAL : 20	overflow of the speed meter
FAL : 128	internal error of the meter
FAL : 129	system error
FAL : 130	CRC error
FAL : 131	Launched RESET through Watchdog
FAL : 150	the inverter didn't answer the sent order during 30ms (lack of byte)
FAL : 151	the inverter answered NAK after sending the order
FAL : 152	inverter didn't put BETRIEBSBEREIT=1 in reply to FREIGABE=0
FAL : 252	unidentified error of the RS485 broadcast during the reception and the verification of the code of the error from the inverter
FAL : 253	the driver didn't obtain one of bytes out of the inverter at the reception of the code of the error (time limit 30 ms)
FAL : 254	the attempt at reading the code of the error from the inverter didn't succeed (wrong CRC)
FAL : 255	unidentified error of the contact driver – inverter

7.6.9. Reset – deleting all programs, the user settings and restoring of the default settings

With **UP** and **DOWN** keys we choose the **YES** or **NO** option and confirm it with pressing the **SET** key.



Choosing the yes option irreversibly deletes all programs and the user settings. Default setting will be loaded. Shall no key be pressed within 20 seconds, the device will automatically return to the main screen.

ATTENTION!

In case of deleting all user programs, when no. 1 program is currently active (default program), please follow the instructions below before continuing:

- enter the **List of user programs** ,
- select **no. 1** program  **1**,
- press **SET** key,
- choose **DELETE** option.

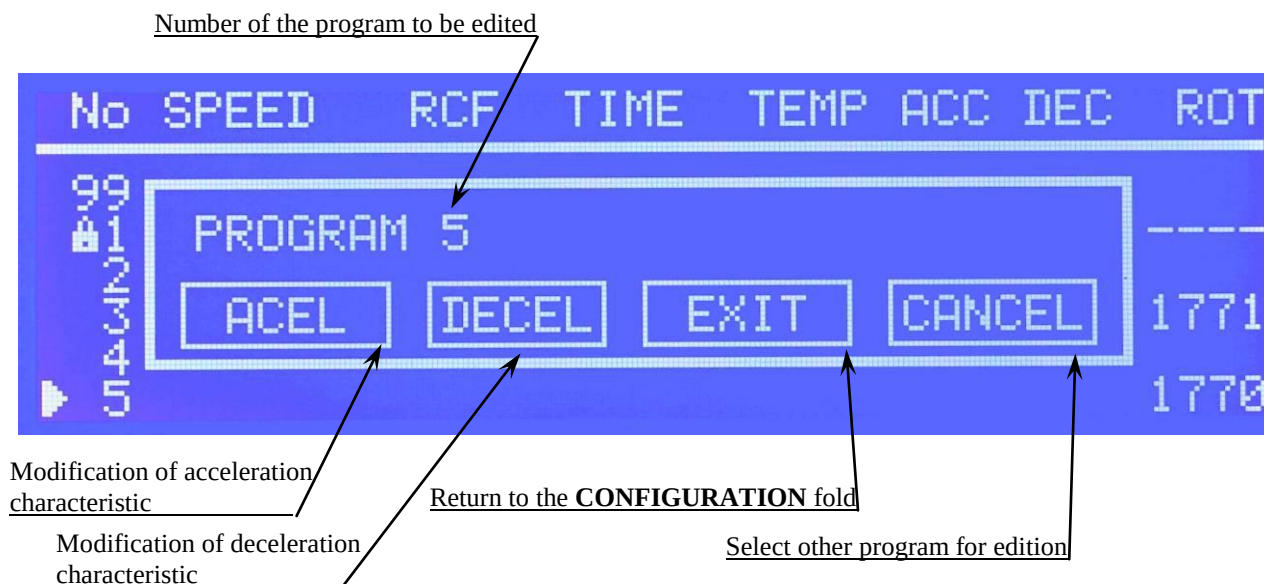
7.6.10. Curves – acceleration and deceleration curves

The user has a possibility to program up to 10 characteristics of acceleration or deceleration of numbers from 10 to 19 (automatic numbering).

Characteristics shaping process comprises 2 stages:

- first it is necessary to save current settings in the user's program (see p.7.4.6.)
- then it is necessary to proceed to the **CONFIG\CURVES** fold and load the program saved previously (edition of acceleration **ACC** or deceleration **DEC** characteristics).

After choosing the program we want to edit, and pressing the **SET** key, the selection window will appear (exemplary edition of **PROGRAM 3**):

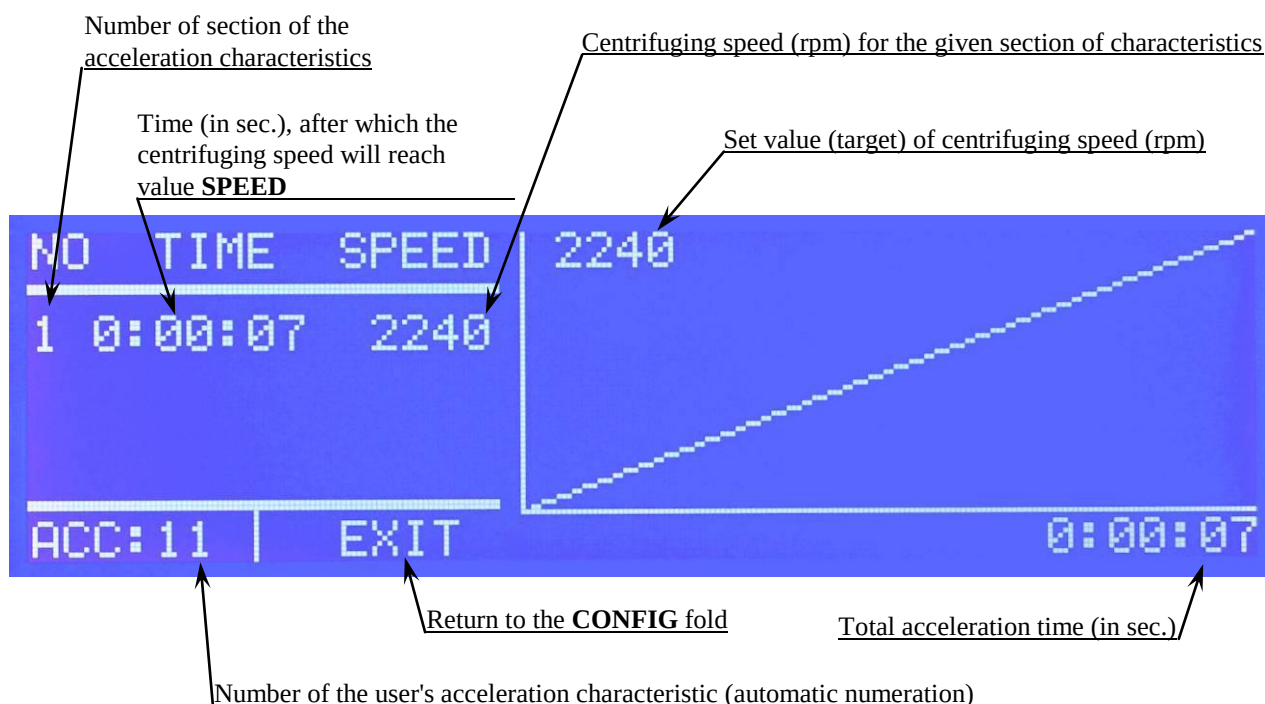


The message is blinking on the active field. With **UP** and **DOWN** keys one should select the desired option and confirm it by pressing the **SET** key.

Modification of acceleration characteristics (Acel)

After choosing this option the window of the characteristics wizard is displayed:

Current acceleration characteristics connected with the loaded program will be displayed on the screen.



The **EXIT** field is marked at first (the message is blinking). Pressing the **SET** will cause the return to the **CONFIG / CURVES** fold, without making changes in the acceleration characteristics.

A) PROGRAMMING OF THE FIRST SECTION OF THE ACCELERATION CHARACTERISTICS

To edit the acceleration characteristics, one should mark the section of characteristics with **UP** or **DOWN** key (the whole **TIME+SPEED** line will begin to blink; at this stage it is only a one section with the number 1) and then press the **SET** key. The device will proceed to setting the characteristics' section time (only the set **TIME** value is blinking). With **UP** and **DOWN** keys, one should set the required time value and press the **SET** key.

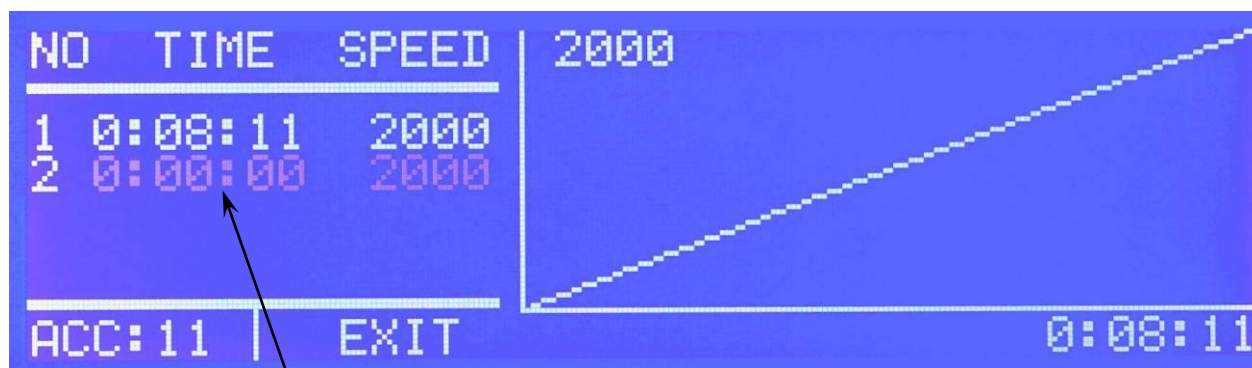
The set time value has to be bigger than 0!

After setting the time the device will proceed to setting the speed of the given section of characteristics (only the set value **SPEED** blinks). With **UP** and **DOWN** keys one should set the speed value and press the **SET** key.

*The set speed value is limited by the maximum speed of the rotor connected with the edited program. After the end of programming the speed, the graphical displaying of the section (of all sections) will occur **TIME+SPEED** of the user's acceleration characteristics.*

B) PROGRAMMING OF THE NEXT SECTIONS OF CHARACTERISTIC

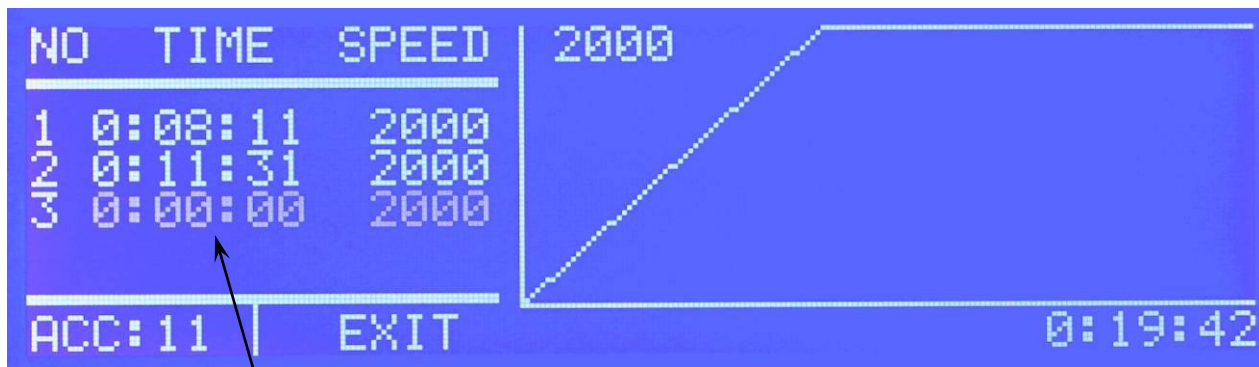
After programming the section 1, there is a possibility to program the next section, number 2:



Programming of new section possible (the whole line 2 is blinking). Programming as in the case of section 1. It is possible also to abandon the programming: with **UP/DOWN** keys choose the **EXIT** option (it will blink) and save (press the **SET**) only the acceleration characteristics of 1 section with **TIME/SPEED** parameters described in the line 1

The minimal speed of the next section of acceleration characteristics is equal to the speed of the already programmed previous section (in the above-mentioned case the programmed speed of section 1 = 2000 rpm, the lowest speed possible for programming of a section 2=2000 rpm)

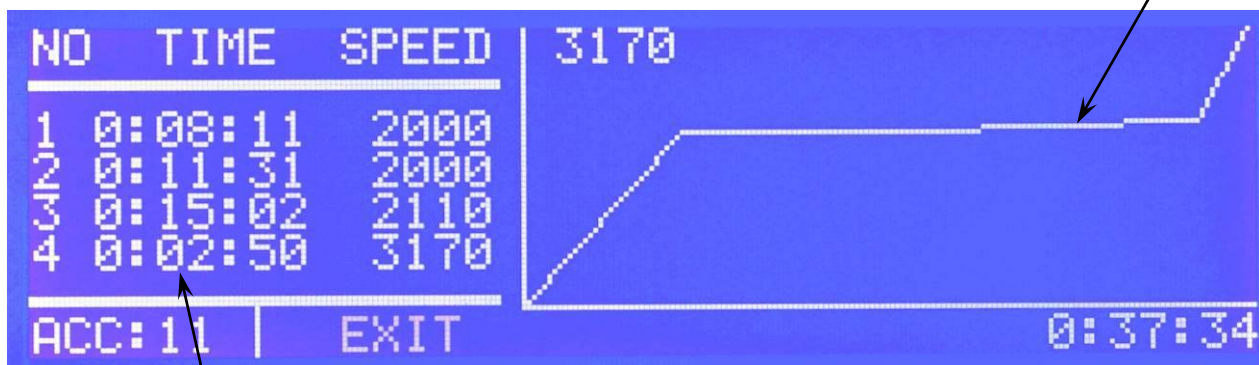
After programming the section 2, there is a possibility to program the next section, number 3



Programming of new section possible (the whole line 3 is blinking). Programming as in the case of section 1. It is possible also to abandon the programming: with **UP/DOWN** keys choose the **EXIT** option (it will blink) and save (press the **SET**) only the acceleration characteristics of 2 section with **TIME/SPEED** parameters described in the line 1 and 2

After programming the section 3, there is a possibility to program the next section, number 4:

The variability of the programmed acceleration characteristics comprising four sections



Programming of new section possible (the whole line 4 is blinking). Programming as in the case of section 1. It is possible also to abandon the programming: with **UP/DOWN** keys choose the **EXIT** option (it will blink) and save (press the **SET**) only the acceleration characteristics of 3 section with **TIME/SPEED** parameters described in the line 1, 2 and 3

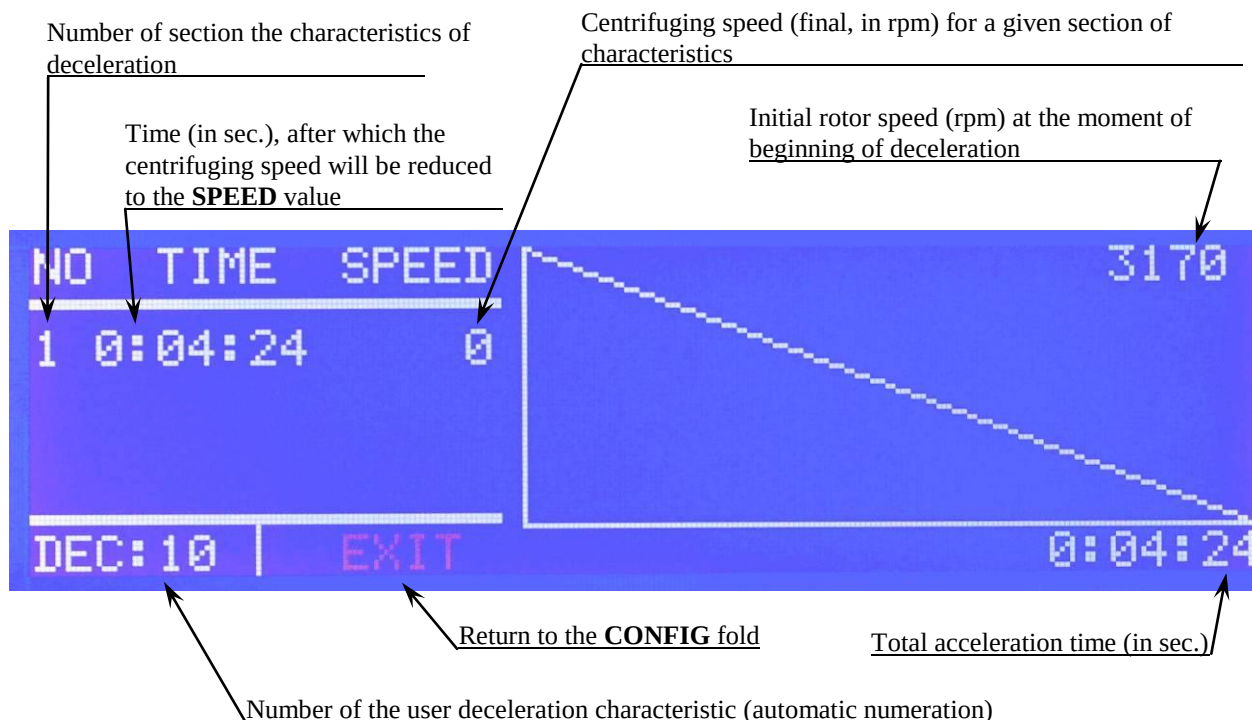
The speed of the last of programmed sections of acceleration characteristics overwrites the speed set in the edited program

Repeated attempt to program already programmed sections of the acceleration characteristics will cause beginning of programming of the whole acceleration characteristics once again (with settings of the program loaded to edition).

Modification of deceleration characteristics (Decel)

After choosing this option the window of the characteristics wizard is displayed:

Default deceleration characteristics connected with the loaded program will be displayed on the screen. Creating of deceleration characteristics takes place a little differently than acceleration characteristics.



In the first moment, the **EXIT** field is marked (the message is blinking). Pressing the **SET** key will cause returning to the **CONFIG / CURVES** fold, without making changes in the deceleration characteristics.

A) PROGRAMMING OF THE FIRST SECTION OF THE DECELERATION CHARACTERISTIC

To edit the deceleration characteristics, one should mark the section of characteristics with **UP** or **DOWN** key (the whole **TIME+SPEED** line will begin to blink; at this stage, it is only one section, with the number 1) and then press the **SET** key. The device will proceed to setting the characteristics' section time (only the set **TIME** value is blinking). With **UP** and **DOWN** keys, one should set the required time value and press the **SET** key.

The set time value has to be bigger than 0!

After setting the time the device will proceed to setting the speed of the given section of characteristics (only the set value **SPEED** blinks). With **UP** and **DOWN** keys one should set the speed value and press the **SET** key.

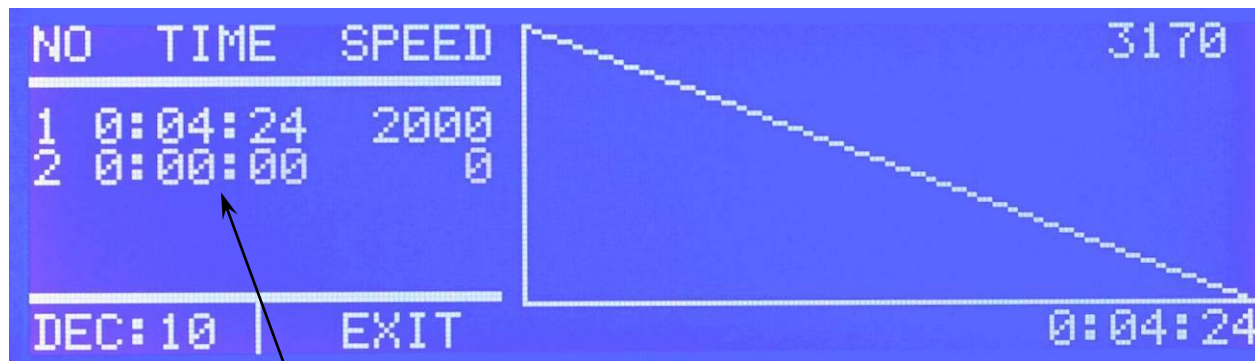
The set speed value cannot be higher than the initial speed of the rotor at the moment of beginning of deceleration (the set speed of centrifuging).

In order to complete the creation of the deceleration curve it is necessary for the speed of the last of programmed sections of the curve to be equal = 0. Otherwise the curves wizard will not enable the end of programming (it will be impossible to select the EXIT option)

B) PROGRAMMING OF THE NEXT SECTIONS OF CHARACTERISTIC

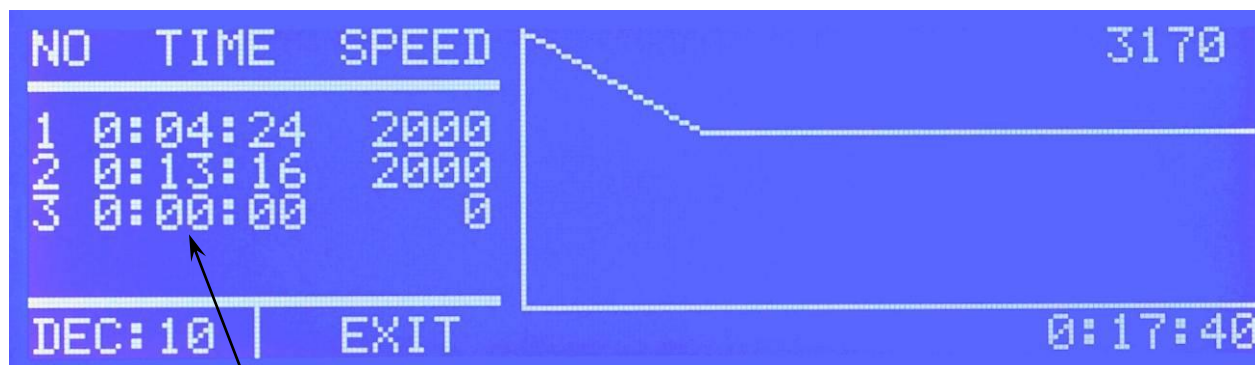
After programming the section 1, there is a possibility to program the next section, number 2:

The maximum speed of the next section of deceleration characteristic is equal to the speed programmed already of the previous section (in the above-mentioned case the speed programmed of section 1 = 3470 rpm, highest speed possible for programming of the section 2=3470 rpm)



New section programming possible (the whole line 2 is blinking). Programming as in the case of the section 1. To stop creating the deceleration curve at the stage of two sections, it is necessary to set the speed in section 2 to 0 and press the **SET** key

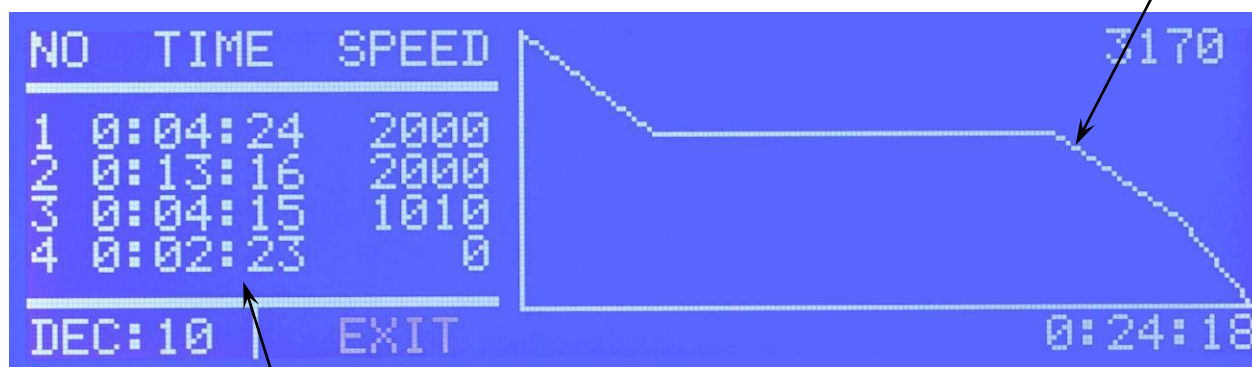
After programming the section 2, there is a possibility to program the next section, number 3:



New section programming possible (the whole line 3 is blinking). Programming as in the case of the section 1. To stop creating the deceleration curve at the stage of three sections, it is necessary to set the speed in section 3 to 0 and press the **SET** key

After programming the section 3, there is a possibility to program the next section, number 4:

Course programmed of acceleration characteristic put together from four sections of starting looks like this



New section programming possible (the whole line 4 is blinking). Programming as in the case of the section 1. If speed of the last section=0, it is possible to save the created characteristics by choosing the **EXIT** option with **UP/DOWN** keys and pressing the **SET** key

Repeated attempt to program already programmed sections of the acceleration characteristics will cause beginning of programming of the whole deceleration characteristics once again (with settings of the program loaded to edition).

7.6.11. Rotor Runtime – preview of the quantity of the working cycles and the centrifuging time for each rotor

The fold contains data of the time of centrifuging and of the quantity of the working cycles of each rotor. The table also contains icons warning of the duty of execution of validation.

also contains tests warning of the day of execution or validation.						
No	S	ROTOR	BUCKET	CYCLES	C.NOM	TIME
00146121	✓	11761		0	15000	0
	✓	11762		0	15000	0
	✓	11763		0	15000	0
	✓	11765		0	15000	0
	✓	11766		0	15000	0
	✓	11767		0	15000	0

Scroll the table with **UP** and **DOWN** keys. Exit the fold with the **SET** key.

7.6.12. 10 – Cycles – preview of spinning parameters of 10 last cycles

The fold contains information concerning the parameters of ten last cycles of centrifuging.

NO_CYCLES: 1	
DATA/TIME:	2008.08.13/ 12:08
PROG:	--
ROTOR/BUCKET:	11772/-----
SPEED:	17500
RCF:	29787
TIME:	0:02:00

Scroll the list with **UP** and **DOWN** keys. Change the number of cycle with the **SET** key. Exit the fold with the **STOP** key.

7.6.13. Contact Us – fold with data of the MPW company

The fold contains information about the type of the centrifuge, number of program and contact data of the MPW Company.

Marker informing on the available direction of the scrolling:

↓ ; only down with **DOWN** key

↑↓ ; both up and down with **UP** / **DOWN** keys

↑ ; only upwards with **UP** key



Exit the fold with the **SET** key.

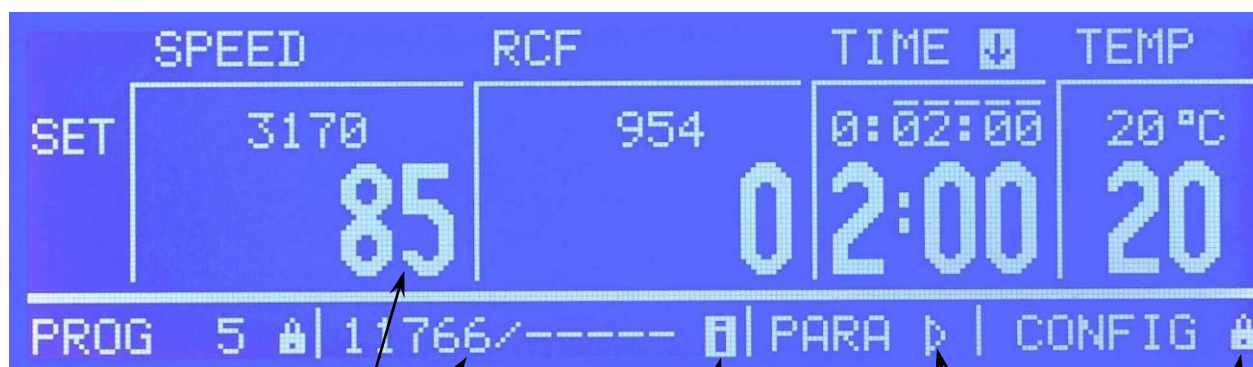
Shall no key be pressed within 20 seconds, the device will automatically return to the main screen.

7.7. Starting of centrifuging

Before beginning the centrifuging one should put on the rotor, close the cover and program parameters of centrifuging, particularly:

- to program the rotor of the number consistent with the assumed rotor
- to program the speed, centrifuging time and the set temperature

Press the **START** key. The fan of the engine is switched on and the process of identification of the rotor is being started:



Identification speed
85 rpm

Number of the chosen rotor

Marker informing that identification
of the rotor is lasting

Empty arrow
means limited
access to settings during
centrifuging while filled
one: unlimited access

"padlock" icon
signalling the ban
on the access
to the given zone

Identification of the rotor lasts up to 6 seconds. Shall the read number of the installed rotor is compliant with the chosen rotor, the device will accelerate the rotor up to the set speed.

Otherwise centrifuging is stopped and the error screen is being displayed:

Message about the reason of the stoppage in work of the centrifuge



Identified number of the installed rotor. If the rotor is unknown the "--?--" sign is being displayed

7.7.1. Errors screens

An irregularity in operations of the centrifuge is signalled by displaying a screen with relevant message [a sound signal is also emitted]. The error screen is displayed until pressing the **SET** key.

All important errors are stored and can be reviewed in **CONFIG** → **SENSOR** fold (see p. 7.6.8).

As the display is capable of containing only one message at a time, the following priority of importance of the displayed data applies:

1. error of driver – inverter communication
2. Error of the I2C connection
3. Error of the measurement of the temperature
4. Overheating motor
5. Error of inverter
6. Rotor unbalancing **MPW-380R**
7. Overheating of the slowing down resistor
8. Cover opened during centrifuging **MPW-380R**
9. pressure control actuation
10. measurement of the temperature is out of operation
11. speed during identification of the rotor other than 85 rpm
12. overheating of the centrifuge above 50 °C

Displayed error messages are as follows:

IMBALANCE FAST STOP!
PLEASE REMOVE CAUSE THEN RESTART

OVERHEATING MOTOR!

OVERHEATING BRAKING RESISTOR!

OPENING COVER in RUN!

PRESSURE CONTROL ACTUATION!

TEMPERATURE SENSOR ERROR
ERROR = {code of error}

MPW-380R

INVERTER ERROR!
ERROR = {code of error}

SPEED METER ERROR!

SPEED OF ROTOR IDENTIFICATION<>85 RPM

I2C BUS ERROR!

INVERTER SERIAL BUS ERROR!
ERROR = {code of error}

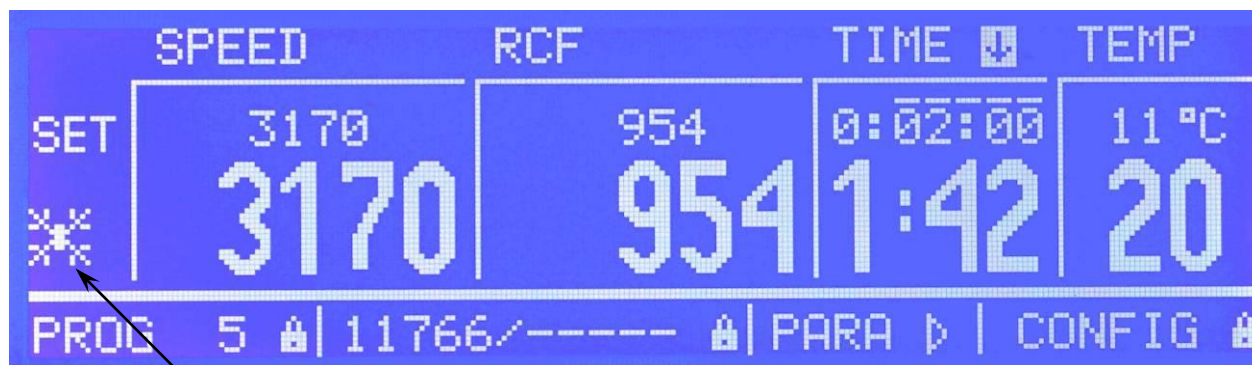
NO ROTOR!

INCORRECT ROTOR NUMBER!

ROTOR STOPPING!
Please wait ...

7.7.2. Stabilization of the temperature of the centrifuge MPW-380R

Stabilization of the temperature of the centrifuge takes place with $\pm 1^\circ\text{C}$ accuracy round the assigned value. Turning on the compressor and starting the cooling is signalled with the icon on the display. After switching the compressor off, one has to wait 15 seconds before switching it on again.



Mark by the switching the
compressor on (cooling)

7.7.3. Screens informing about the end of centrifuging

Centrifuging may be stopped at the any moment with the **STOP** key. The information message is being displayed then:



After pressing the **SET** key, the device returns to the main screen.

Stopping centrifuging in accordance with the set time causes generating 3 short audible signals (after stopping the rotor) and displaying the message:



After pressing the **SET** key, the device returns to the main screen.

7.7.4. Additional messages

1. In the case of power shortage while centrifuging, after repeated switching it on, the following error screen will be displayed



After pressing the **SET** key, the message is permanently deleted.

2. After operating for 2000 hours, after every switching on the centrifuge the error screen is being displayed with information about the necessity to carry out servicing activities. After pressing the **SET** key, the device proceeds to the main screen and the device may operate.



This message cannot be deleted by pressing the SET key. Only the manufacture's service of the centrifuge is able to delete it.

7.8. Change of settings in zones

1. CENTRIFUGE IS NOT WORKING:

- Program no. 1 loaded:
no access to: **SPEED, RCF, TIME, TEMP, ROTORS LIST, PARA.**
- A program with modified acceleration or deceleration characteristics loaded (ACEL>9 / DECEL >9):
no access to: **SPEED, RCF, ROTORS LIST.**
- Access password is set:
No access to: **CONFIG** (required providing the password)
- **COOLING** active function: **MPW-380R**
No access to: **TEMP.**

2. CENTRIFUGE IS WORKING

- No access to **PROGRAM LIST, ROTORS LIST** and **CONFIG** and besides:
- if program No. 1 is loaded: no access to any zone;
- if a program with modified acceleration or deceleration characteristics is loaded (ACEL>9 / DECEL >9) :
no access to: **SPEED** and **RCF**

7.9. Unbalance

The centrifuge is provided with the rotor unbalance sensor and when it will be activated, centrifugation process will be stopped through fast braking and at the same time an error message will be displayed (see p. 7.5.1.). Cancellation of this error is possible only through pressing **COVER** key after stopping of the rotor. One must check if rotor was correctly loaded, close the cover and once more start the program. In order to protect the rotor against beating in opposite areas of the rotor, it has to be provided with identically filled buckets, carriers, test-tubes etc. for getting the best balance possible. Unbalance causes noise and vibrations during operation, and adversely affects power transmission system (motor, shock absorbers). The better balance, the smoother will be the centrifuge operation and therefore longer life of usage of the driveline. Moreover, the ideal separation level is then obtained, as already separated constituents would not be moved up by vibration.

7.10. Emergency stop

In any moment of centrifuging it is possible interrupt the process and fast stop the rotor. Single-time pressing of the **STOP** key will make centrifuging stop with acceleration characteristics set in the program. Pressing and holding it up to 1s will make the centrifuging stop with the most strict characteristic.

7.11. Completion of the centrifuging

After expiry of the time of centrifuging set in the program, the rotor decelerates in accordance with chosen characteristics. At the end of deceleration, rotational speed drops slower in order to ensure soft settling of rotor carriers. After stopping, sound signal is generated and the **STOP** diode goes off. After pressing **COVER** key, the cover opens and the **COVER** diode goes on.

7.12. Mathematical relations.

7.12.1. RCF – relative centripetal force.

RCF acceleration is the acceleration generated by the rotary motion of the rotor acting upon tested product and it can be calculated according to the formula:

$$\text{RCF} = 11,18 \times r \times (n/1000)^2$$

$$\text{RCF} \quad [\times g], \quad r \quad [\text{cm}], \quad n \quad [\text{rpm}]$$

Depending on the distance of particles of the tested product from the axis of rotation, one can establish with use of the above formula the minimum RCF, average RCF or maximum RCF. On the basis of preset RCF value and given radius of the bottom of the bucket one can calculate with it the rotational speed to be set in the program of centrifuging. Selection of the time of sedimentation and the RCF value shall be carried out experimentally for any given product.

Once every 100 rpm, an electronic circuit automatically calculates and displays RCF value. In order to program required RCF value one shall use nomograph (Drawing No. 5) or change the rotational speed, matching displayed value to required acceleration value.

7.12.2. Nomograph of relationship - rotational speed/centrifuging radius/RCF – Drawing No. 5.

7.12.3. Maximum load.

In order to avoid overloading of the rotor one shall observe maximum load which is recorded on every rotor. Maximum permissible load is reached when all test-tubes are filled with the fluid with 1.2 g/cm^3 density. If density of the centrifuged liquid is higher than 1.2 g/cm^3 , then test-tubes could be filled only partially or one shall limit operation speed of the centrifuge, which is being calculated from the formula:

$$n_{\text{perm}} = n_{\text{max}} * \sqrt{\frac{1,2}{\gamma}}; \quad \gamma = \text{specific gravity} \left[\frac{G}{\text{cm}^3} \right]; \quad n_{\text{max}} \quad [\text{maximum rotational speed - rpm}]$$

7.13. Temperature in rotational chamber. **MPW-380R**

Centrifuge is equipped in ecological refrigerating system with temperature control. During centrifugation, there may appear differences in temperature on the display and temperature of the samples in the rotor. It depends on thermal conductivity of the rotor, and samples and centrifugation time.

In order to centrifuge preparations of a lowered temperature (deposited in the outside refrigerator) it is necessary to make initial refrigerating of the chamber, the rotor and containers, to the set low temperature, in order to minimise the difference of temperatures. In order to obtain lower temperatures of the chamber we recommend:

- *with centrifuging loading the program 1. In centrifuge, there spin rotors with maximum speed 2500 rpm in 30 min. obtaining the temperature 4° C.*

It is possible to cool the centrifuge chamber with the rotor stopped (standby mode cooling). To do so, one should activate the COOLING function in the PARA fold (see p. 7.5.5.) and set the desired temperature within range from 0 °C to the ambient temperature. The function activates automatically after confirmation and with the cover closed. Opening the cover switches the cooling process off; when the cover is closed again, the function is reactivated again. If the COOLING function is ON during the centrifuging cycle, after the cycle ends, the device switches into cooling regime with centrifuging OFF until the cover gets open.

Cooling of the centrifuging chamber also takes place with centrifuging in SHORT function.

The cooling system allows for cooling every available rotor with equipment with maximum speed up to 4°C. Lower temperatures can be obtained when taking into consideration the type of rotor and speed.

8. Cleaning, disinfection, maintenance.

CAUTION! *It is necessary to use protective gloves during following work.*

8.1. Cleaning of the centrifuge.

For cleaning, water with soap or other water soluble mild detergent shall be used. One should avoid corrosive and aggressive substances. It is prohibited to use alkaline solutions, inflammable solvents or agents containing abrasive particles. Using wiping cloth, remove condensate or residues of the products from the rotor chamber. It is recommended to keep the cover opened when the centrifuge does not work in order to expel the moisture.



In the case the user decides to use centrifuge and equipment cleaning methods other than the ones described in this manual, the user shall contact the device manufacturer in order to check whether the cleaning method chosen does not damage the device.

8.2. Cleaning of the accessories.

In order to ensure safe operation one shall carry out in regular way periodical maintenance of the accessories. Manufactured rotors, buckets and round carriers have to withstand steady high stresses originating from the field of gravitation. Chemical reactions as well as corrosion (combination of variable pressure and chemical reactions) can cause corrosion or destruction of metals. Hard to observe surface cracks increase gradually and weaken material without visible symptoms. In the case of observation of surface damage, crevice or other change, as well as the corrosion, the given part (rotor, bucket, etc.) shall be immediately replaced. In order to prevent corrosion one has to clean regularly the rotor with the fastening bolt, buckets and round carriers. Cleaning of the accessories shall be carried out outside of the centrifuge once every week or still better after each use. Then, those parts shall be dried using soft fabric or in the chamber drier at ca. 50° C.

Especially prone to the corrosion are parts made of aluminium. For cleaning them one should use neutral agent of pH value from 6 to 8. It is forbidden to use alkaline agent of pH above 8. In this way, the useful service life of the device is substantially increased and susceptibility to corrosion is diminished. Accurate maintenance increases the service life as well and protects against premature rotor failures. Corrosion and damages resulting from insufficient maintenance could not be subject of claims lodged against the manufacturer.

8.3. Lubrication.

The rotor pins shall be always lubricated with technical petroleum jelly. In this way, the uniform deflection of the buckets and quiet centrifuge operation is ensured.

8.4. Glass tube cracking.

In the case of glass tube cracking, all debris shall be accurately removed. Rubber inserts shall be exactly cleaned or possibly replaced. Otherwise one has to take into account following possibilities:

- Glass particles left in the rubber cushion (pad) will cause once more glass cracking.
- Glass particles left in containers make impossible uniform deflecting of the buckets and round carriers resulting in unbalance.
- Glass particles left in the rotor chamber cause metal abrasion because of strong air circulation. This dust will not only contaminate the centrifuge chamber, rotor, buckets, carriers and centrifuged material but will cause as well damages of surfaces of the accessories, rotors and the rotation chamber. For complete removal of glass particles and metal dust from the rotor chamber it is recommended to place strip of vaseline on the bowl (from the top down to bottom). Then rotor shall operate for several minutes at moderate speed. Glass and metal particles will gather on lubricated area and could be easily removed with the piece of cloth together with the grease. This operation can be repeated in case of a need.

8.5. Sterilization and disinfections of the rotating chamber and accessories.

One can use all standard disinfectants. The centrifuges and accessories are constructed from various materials and one should take into account possible variety of materials. During sterilization by means of steam one should consider temperature resistance of individual materials.

STERILIZATION

	Sterilization* temp. 121 °C, time 20 min	Radiation – β/γ 25 kGy	Gas (ethylene oxide)	Chemical compounds (formalin, ethanol)
PS	no	yes	no	yes
SAN	no	no	yes	yes
PMMA	no	yes	no	yes
PC	yes ¹⁾	yes	yes	yes
PVC	no ²⁾	no	yes	yes
POM	yes ¹⁾	yes	yes	yes
PE-LD	no	yes	yes	yes
PE-HD	no	yes	yes	yes
PP	yes	yes	yes	yes
PMP	yes	yes	yes	yes
ECTFE/ETFE	yes	no	yes	yes
PTFE	yes	no	yes	yes
FEP/PFA	yes	no	yes	yes
FKM	yes	-	yes	yes
EPDM	yes	-	yes	yes
NR	no	no	yes	yes
SI	yes	no	yes	yes
* Laboratory vessels have to be exactly cleaned and rinsed with the distilled water before the sterilization in the autoclave. It is always necessary to remove closures from containers!				
1) The frequent steam sterilization reduces mechanical durability! PC test tubes may become useless.				
2) Except PVC hoses which are resistant to the steam sterilization in the temperature 121 °C.				

Abbreviations of names of characterized plastics

PS:	Polystyrene	ECTFE:	Ethylene/chlorotrifluoroethylene
SAN:	Styrene-acrylonitrile	ETFE:	Ethylene/tetrafluoroethylene
PMMA:	Polymethyl methacrylate	PTFE:	Polytetrafluoroethylene
PC:	Polycarbonate	FEP:	Tetrafluoroethylene/perfluoropropylene
PVC:	Polyvinyl chloride	PFA	Tetrafluoroethylene/perfluoroalkylvinylether
POM:	Acetal polyoxymethylenel	FKM	Fluorcarbon rubber
PE-LD:	Low density polyethylene	EPDM:	Ethylene propylene diene
PE-HD:	High density polyethylene	NR:	Natural rubber
PP:	Polypropylene	SI:	Silicon rubber
PMP:	Polymethylpentene		



For centrifuging infectious materials it is necessary to use hermetically closed buckets, in order to prevent they migration into the centrifuge.

Rotors, buckets and round carriers can be sterilized in autoclave with temperature 121° – 124° C and pressure 215 kPa during 20 min. In the centrifuge, disinfectants and cleaning agents generally used in medical care should be used (e.g. Aerodesina-2000, Lysoformin 3000, Melseptol, Melsept SF, Sanepidex, Cutasept F).



*User is responsible for proper disinfections of the centrifuge, if some dangerous material was spilled inside or outside of the centrifuge.
During the above mentioned works one must wear safety gloves.*

9. Emergency conditions – service.

9.1. Fault finding.

Majority of faults could be removed by switching the centrifuge **OFF** and then **ON**. After switching the centrifuge **ON**, there shall be displayed parameters of the recently implemented program and sound signals comprising four successive tones shall be generated. In the case of short-duration power failure the centrifuge terminates the cycle and displays **PROGRAM ERROR** code.

Please find below the most frequent faults and their repair methods.

MPW-380/R	
1. Lack of display and check sound:	Remedy:
• <i>Is supply cable plugged into mains?</i>	<i>Plugs supply cable correctly.</i>
• <i>Is master switch ON?</i>	<i>Switch ON power supply.</i>
• <i>The above was checked and still there is no display active and check sound audible.</i>	<i>Call service.</i>
2. Centrifuge does not start	Remedy
<i>Motor error is displayed</i>	<i>Call service</i>
• START key pressing does not generate reaction or single tone only -START diode is on -COVER diode is on -dot on the display is blinking:	-Wait till rotor stops and the START diode goes off -Close cover. COVER diode must switch off. - Centrifugation cycle in progress, press STOP key or wait till cycle ends.
• <i>Indications are proof for cycle in progress and motor does not start</i>	<i>Switch power supply OFF/ON. If fault still persists, call service.</i>
3. Centrifuge starts but not accelerates	Remedy
• <i>After stopping unbalance message is displayed</i> -Unequal rotor load -Inclined centrifuge -Faulty drive (mechanical damage) -Centrifuge was displaced during operation	-Centrifuge load shall be balanced -Centrifuge shall be levelled -Call service -Switch ON the centrifuge again after opening and closing the cover
• <i>After stopping error rotor message is displayed</i>	Check: -if rotor number in started program is consistent with the number of the rotor installed in the centrifuge -rotor status (if there are coding magnets inserted)
• <i>Centrifuge does not recognize the rotor and does not stop</i>	<i>Switch the centrifuge OFF, then ON and check correctness of loaded program</i>
• <i>Centrifuge still does not recognize the rotor</i>	<i>Call service</i>

4. It is not possible to open the cover.	Remedy
• dot on the display is blinking, after pressing COVER key single tone is audible	Rotor is still rotating. Wait for stopping of the rotor and displaying of the square symbol
• Nothing is displayed	Check the centrifuge power supply
• dot on the display is not blinking, but cover can not be opened	Call service
5. Centrifuge is working and mains failure	Remedy
• The message will be displayed on the display about the decay of tension.	Wait for stopping of the rotor, clear the error by pressing the SET key.
MPW-380R	
6. Damage the temperature sensor.	Remedy
• The message will be displayed on the display about the error of temperature sensor	Check whether the sensor is connected to the steering plate correctly.
• The sensor is connected correctly, and the error is still applying	Call service
7. Error of the exceeding the temperature in the chamber	Remedy
• The overheating message will be displayed	Call service
MPW-380/R	
8. It is not possible to change any parameter	Remedy
• It is not possible to open/save program and change any parameter.	- enter the list of user programs , - select no. 1 program  1, - press SET key, - choose DELETE option.

Emergency cover release!

In the case of e.g. mains failure it is possible to open cover manually. At first, one must be sure that rotor is not in the move (use inspection glass). On the left side of the casing there is a hole with a plug that shall be unplugged. Insert T handle Allen key (17779) into the hole and turn it counterclockwise.



The cover can be unlock and opened only when the rotor is in the rest state.

9.2. Work safety inspection.

For safety reasons, inspections of the centrifuge carried out by the authorized service at least once a year after the period of warranty. The reason for more frequent inspections could be corrosion inducing environment. Examinations should end with issuing "Report of validation, the check on the technical state of the laboratory centrifuge". It is being recommended to establish "Technical passport" or "Log of the apparatus", in whom every repairs and reviews are being registered. Both these documents should be stored in the place of use of the centrifuge.

9.3. Inspection procedures carried out by the operator.

Operator has to pay special attention to the fact that the centrifuge parts of key importance due to safety reasons are not damaged.

This remark is specifically important as for:

1. Motor suspension
2. Motor axis concentricity
3. Fixing the pins in the bucket.
4. Centrifuge accessories and especially structural changes, corrosion, preliminary cracks, abrasion of metal parts.
5. Screw joints.
6. Inspection of the rotor assembly.
7. Inspection of bioseals of the buckets if such are used.
8. Control of execution of the guarantee yearly technical inspection of the centrifuge

Only the manufacturer-specified holders, included in the equipment list, as well as centrifuge capillaries, which diameter, length and durability are suitable, should be used for spinning in this centrifuge. The use of equipment made by other manufacturers should be consulted with the manufacturer of the centrifuge. In the centrifuge, disinfectants and cleaning agents generally used in medical care should be used (e.g. Aerodesina-2000, Lysoformin 3000, Melseptol, Melsept SF, Sanepidex, Cutasept F).

10. Repair conditions.

Manufacturer grants to the Buyer the guarantee on conditions specified in the Guarantee Certificate. Buyer forfeits the right to guarantee repair when using the device inconsistently with the User manual provisions, when damage results from the User's fault or when the Guarantee Certificate was lost.

Repairs should be carried out in authorized service workshops, granted with the MPW Certificate.

The centrifuge shall be sent to repair after decontaminating disinfections.

Information about authorized service workshops could be obtained from the Manufacturer.

11. Disposal.

When you are disposing the device, the respective statutory rules must be observed.

Pursuant to guideline 2002/96/EC (WEEE), all devices supplied after August 13, 2005, may not be disposed as part of domestic waste. The device belongs to 8th group (medical devices) and is categorized in business to business field.



The icon of the crossed-out trash can shows that the device may not be disposed as part of domestic waste.

The waste disposal guidelines of the individual EC countries might vary. If necessary, contact your supplier.

12. Manufacturer's data.

MPW Med. instruments

46 Boremlowska Street

04-347 Warsaw/Poland

tel. +48 22 610 56 67 sales department,

+48 22 610 81 07 service

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e-mail: mpw@mpw.pl

www.mpw.pl

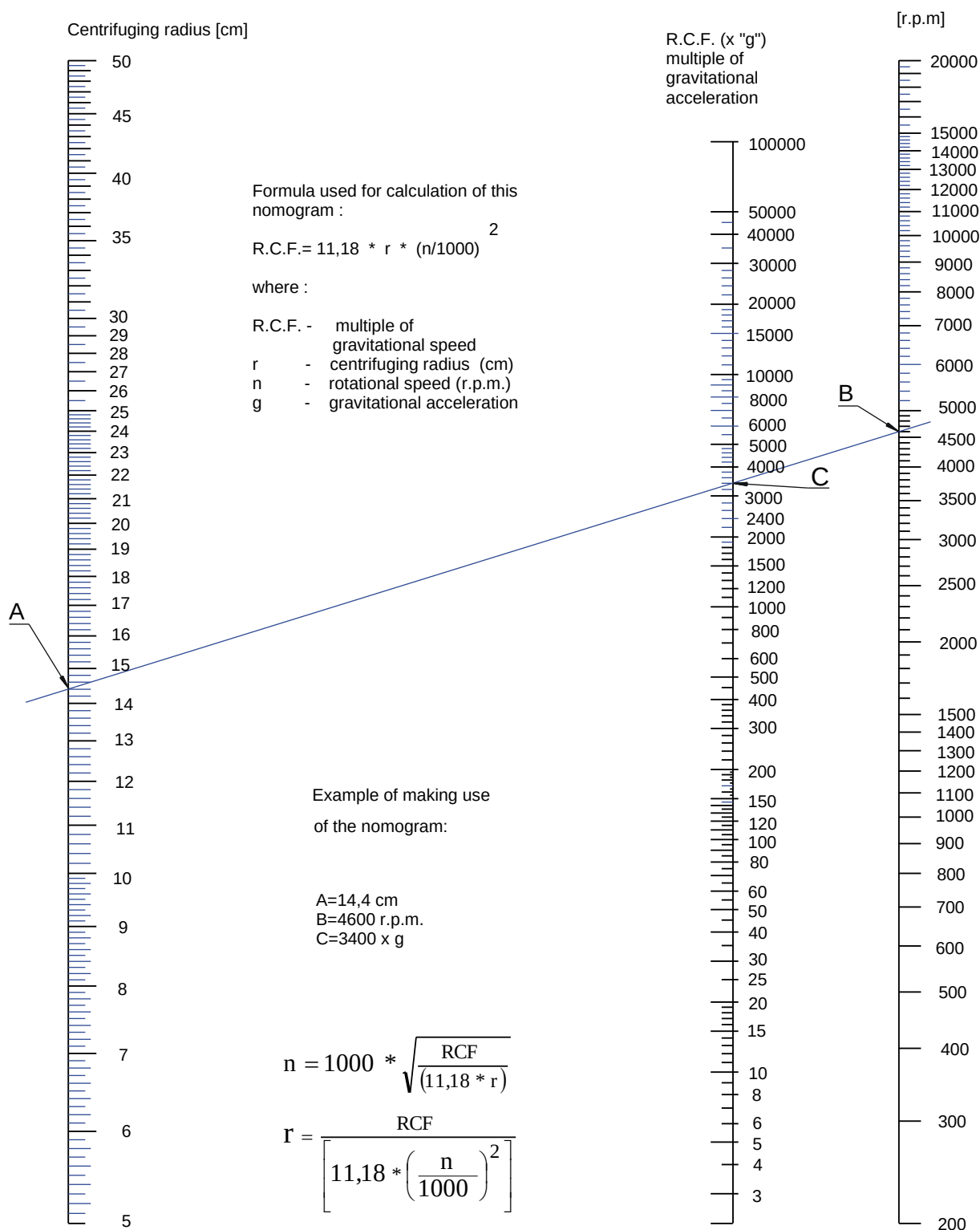
13. Distributor information.

DISTRIBUTOR:

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14. Appendix.

14.1. Nomograph.



Drawing No. 5 – Nomograph.

14.2. Table of chemical resistance to the interaction of various categories of reagents of plastics

Groups of the substance in temp. 20°C	PS	SAN	PMMA	PC	PCV	POM	PE-LD	PE-HD	PP	PMP	ECTFE ETFE	PTFE FEP PFA	FKM	EPDM	NR	SI
Aldehydes	-	-	○	○	-	○	-	+	+	○	+	+	+	+	○	○
Cyclic alcohols	+	+	+	+	+	+	+	+	+	+	+	+	-	+	+	+
Esters	-	-	-	-	-	-	+	○	○	○	+	+	-	○	○	○
Ether	-	-	-	-	-	+	+	○	○	-	+	+	-	-	-	-
Ketones	-	-	-	-	-	+	○	○	○	○	○	+	-	○	-	-
Strong or concentrated acids	○	-	-	-	+	-	+	+	+	+	+	+		+	-	-
Weak or diluted acids	○	○	○	○	+	-	+	+	+	+	+	+	+	+	○	○
Oxidizing acids or oxidizing substances	-	-	-	-	-	-	-	-	-	-	+	+	○	○	-	-
cyclic hydrocarbons	-	-	○	○	+	+	+	+	+	○	+	+	○	-	-	-
Ahs	-	-	-	-	-	+	+	○	○	-	+	+	○	-	-	-
Haloid hydrocarbons	-	-	-	-	-	+	+	○	○	-	+	+	○	-	-	-
Alkalis	+	+	-	-	+	+	+	+	+	+	+	+	○	+	+	○

+ = very good chemical resistance

Permanent action of the substance does not cause damage through 30 days. The material is able to be resistant through years.

○ = chemical resistance of good to limited

Continuous action of the substance causes insignificant and partly reversible damage through the period of 7-30 days (e.g. puffing up, softening, reduced mechanical durability, discolouring).

- = limited chemical resistance

The material should not have the continuous contact with the substance. The immediate occurrence of damage is possible (e.g. the loss of mechanical durability, deformation, discolouring, bursting, dissolving).

Abbreviations of names of characterized plastics

PS:	Polystyrene	ECTFE:	Ethylene/chlorotrifluoroethylene
SAN:	Styrene-acrylonitrile	ETFE:	Ethylene/tetrafluoroethylene
PMMA:	Polymethyl methacrylate	PTFE:	Polytetrafluoroethylene
PC:	Polycarbonate	FEP:	Tetrafluoroethylene/perfluoropropylene
PVC:	Polyvinyl chloride	PFA	Tetrafluoroethylene/perfluoroalkylvinylether
POM:	Acetal polyoxymethylenel	FKM	Fluorcarbon rubber
PE-LD:	Low density polyethylene	EPDM:	Ethylene propylene diene
PE-HD:	High density polyethylene	NR:	Natural rubber
PP:	Polypropylene	SI:	Silicon rubber
PMP:	Polymethylpentene		

14.3. Printing centrifuging – USB, RS232, PRINTER

When the centrifuging process is finished there is a possibility to obtain report. Report can be transferred to PC or printed with a „KAWKA” printer. Devices that offer printing reports are available optionally and they are not delivered with every centrifuge.

❖ PC (USB)

name	quantity (pcs.)	cat. no.
RS232 cable	1	16594
USB converter + USB cable	1	
MPW Editor application	1	

 USB	▪ Connect centrifuge to the PC with the RS232 cable and USB converter (connection diagram is given below). ▪ Install USB converter drivers (see attached CD). ▪ Ensure that serial port (COM) settings are set as described below: ▪ 9600,8,n,1 ▪ Baud rate = 9600 ▪ Parity = none ▪ Stop bit = 1 ▪ Data length = 8 ▪ Install MPW Editor application (Windows) delivered on CD. Centrifuging and report printing ▪ Begin centrifuging process. ▪ Complete report is displayed on the PC screen and can be saved on a hard drive, printed or opened with compatible windows application.
--	--

❖ „Kawka” printer

Components needed to connect printer:

name	quantity (pcs.)	cat. no.
thermal printer „KAWKA” + RS232 cable	1	16595
data transmission cable	1	16593

Actions:

 RS232	- Connect printer to the source of power according to the instructions enclosed in user manual. (connection diagram is given below). - Connect centrifuge with a printer using delivered data transmission cable (16593). - Press START button (begin centrifuging). - When centrifuging process is finished, report will be printed.
---	--

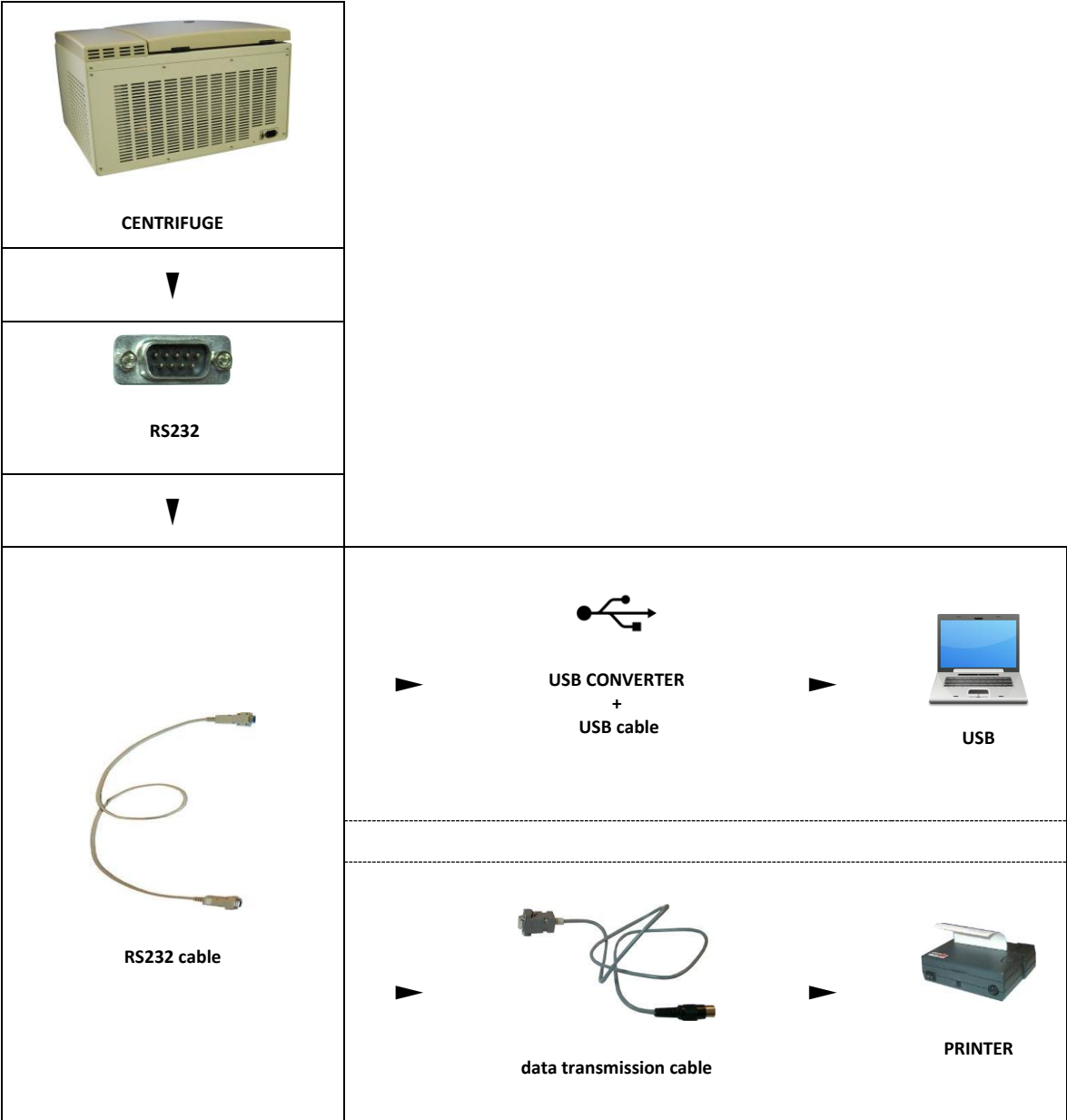
Printout (example)

WITROWKA NPW-380K REPORT NR: _____ 2008.01.01 00:07	START CYKLU WITROWANIA: DANE PROGRAMU: PROG 2 WIRNIK 11771 PRĘDKOŚĆ 2000 RCF 348 CZAS 02 MIN 00 SEC CZAS LICZONY OD NACIŚNIĘCIA START TEMPERATURA 20°C Ch-ka ROZRUCHU 6(0:00:28) Ch-ka HAMOWANIA 6(0:00:22)	KONIEC CYKLU WITROWANIA: PARAMETRY OSIĄGNIĘTE: PRĘDKOŚĆ 2000 CZAS 02 MIN 00 SEC TEMPERATURA 19°C MATERIAŁ:	WYNIK:	OPERATOR: : PRZYJÓŁ: : : : : : : : : : : CZAS: : DATA: : DATA:
--	--	---	---------------	--

Centrifuging date and time are listed in the report

- Date and time are set by the manufacturer for the local area
- In case of printing incorrect date/time, one should connect printer to the PC and set current date/time using delivered application .

Connection diagram





Tel: (+48) 22 673 04 08, 22 879 70 46
Fax: (+48) 22 610 55 36, 22 610 81 01
E-mail: mpw@mpw.pl, www.mpw.pl



- Certified Management System
- DIN EN ISO 9001
- DIN EN ISO 13485

STATEMENT OF CONFORMITY

No 10.380.03/ENG

We, „MPW Med. instruments” Spółdzielnia Pracy
46 Boremlowska Street, 04-347 Warsaw,
Poland

hereby declare under our sole responsibility that the following machine is in accordance with the regulations of the EU Directive 98/79/EC – *in vitro* diagnostic medical devices – due to its conception and design.

Machine:	Laboratory Centrifuge
Type:	MPW – 380
Catalog No:	10380
Product classification on the basis of the Directive 98/79/EC	Non classified to list A or B and not for self-testing
Applied harmonized standards:	
PN-EN ISO 13485:2005	PN-EN 61010-1:2011
PN-EN 61010-2-020:2008	PN-EN 61010-2-101:2005
PN-EN 61326-2-6:2006	PN-EN ISO 14971:2011
PN-EN 13612:2006	PN-EN 980:2010
PN-EN ISO 18113-3:2011	

MPW Med-instruments
SPÓŁDZIELNIA PRACY
(1) w Warszawie

Warszawa, 15.03.2012



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Fax: (+48) 22 610 55 36, 22 610 81 01
E-mail: mpw@mpw.pl, www.mpw.pl



- Certified Management System
- DIN EN ISO 9001
- DIN EN ISO 13485

STATEMENT OF CONFORMITY

No 10.380R.03/ENG

We, „MPW Med. instruments” Spółdzielnia Pracy
46 Boremlowska Street, 04-347 Warsaw,
Poland

hereby declare under our sole responsibility that the following machine is in accordance with the regulations of the EU Directive 98/79/EC – *in vitro* diagnostic medical devices – due to its conception and design.

Machine:	Refrigerated Laboratory Centrifuge
Type:	MPW – 380R
Catalog No:	10380R
Product classification on the basis of the Directive 98/79/EC	Non classified to list A or B and not for self-testing

Applied harmonized standards:

PN-EN ISO 13485:2005
PN-EN 61010-2-020:2008
PN-EN 61326-2-6:2006
PN-EN 13612:2006
PN-EN ISO 18113-3:2011

PN-EN 61010-1:2011
PN-EN 61010-2-101:2005
PN-EN ISO 14971:2011
PN-EN 980:2010

MPW Med-instruments
SPÓŁDZIELNIA PRACY
(1) w Warszawie

Warszawa, 15.03.2012

DECLARATION OF DECONTAMINATION

In order to protect our employees please fill out the declaration of decontamination completely before sending centrifuge to the manufacturer (repair).

1. **Device**

– type:

– serial No.:

2. **Description of decontamination**

(see user manual)

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3. **Decontamination carried out by:**

– name:

4. **Date and signature**

.....

DECLARATION OF DECONTAMINATION

In order to protect our employees please fill out the declaration of decontamination completely before sending centrifuge to the manufacturer (return).

5. **Device**

– type:

– serial No.:

6. **Description of decontamination**

(see user manual)

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7. **Decontamination carried out by:**

– name:

8. **Date and signature**

.....